

APPENDIX F

**SECONDARY TRAFFIC IMPACTS
ROCHESTER WATER RECLAMATION PLANT EXPANSION –
TRUNK SEWER EXTENSION TO KINGS RUN, NORTHWEST TERRITORY,
AND HADLEY VALLEY**

Technical Memorandum

SECONDARY TRAFFIC IMPACTS ROCHESTER WATER RECLAMATION PLANT EXPANSION - TRUNK SEWER EXTENSION TO KINGS RUN, NORTHWEST TERRITORY, AND HADLEY VALLEY

ROCHESTER, MN

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1.0 INTRODUCTION

The City of Rochester plans to expand the Rochester Water Reclamation Plant (RWRP) and construct associated trunk sewer extensions to serve future growth areas within portions of the Kings Run, the Northwest Territory, and Hadley Valley watersheds.

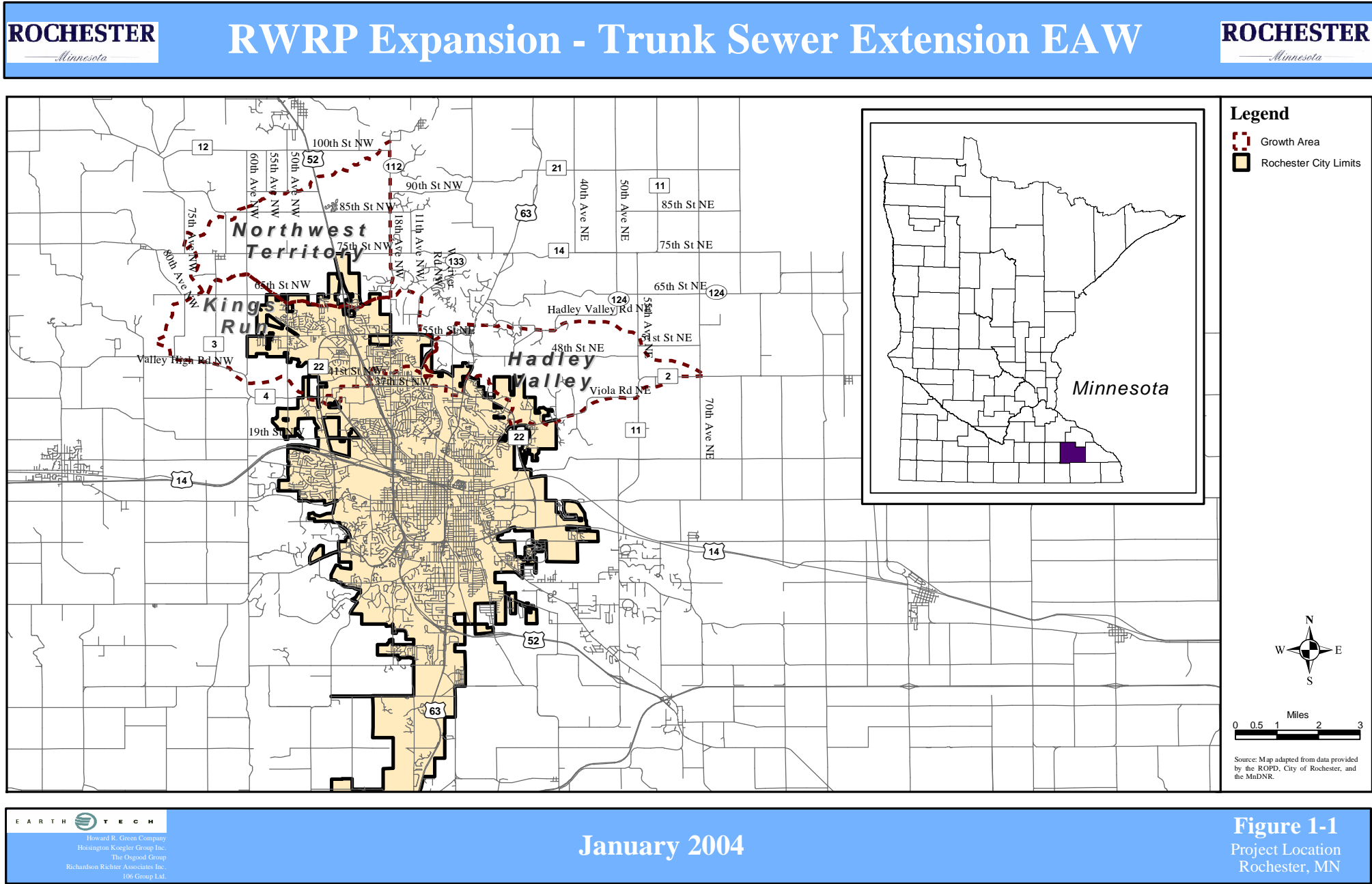
The City of Rochester has submitted a revised National Pollutant Discharge Elimination System (NPDES) Discharge Permit Application for the RWRP expansion response to a Minnesota Pollution Control Agency (MPCA) letter dated November 8, 2002. As indicated in that letter, the City is proceeding with the development of Environmental Assessment Worksheet (EAW) responses associated with the planned RWRP facility expansion and associated trunk sewer extensions. These EAW responses will be submitted to the MPCA who, as the Responsible Governmental Unit (RGU), will prepare and distribute the EAW. The EAW will address environmental issues associated with the RWRP facility expansion and the connected actions and secondary impacts associated with the extension of various trunk sewers planned to serve future growth areas. These areas will be served by new trunk sewers installed as follows:

- West of the Douglas Trail to serve the western most portion of the watershed serving Kings Run consisting of approximately 2,700 acres of undeveloped land within the 7,900-acre watershed.
- North of 55th Street and west of 18th Avenue serving the Northwest Territory covering approximately 7,700 acres.
- East of the Zumbro River serving the Hadley Valley watershed covering approximately 6,300 acres.

The Kings Run, Northwest Territory, and Hadley Valley growth areas are located to the north of the City of Rochester as shown on **Figure 1-1**.

This traffic study was completed to analyze and document the expected traffic impacts associated with development of the Kings Run, Northwest Territory, and Hadley Valley growth areas. The results provide information necessary to complete the EAW document. Analysis within this study area consists of the following elements:

- Identification of existing roadway and intersection characteristics.
- Estimation of future roadway and intersection deficiencies.
- Recommended strategies to mitigate future deficiencies.
- Roadway planning guidelines, including functional classification, jurisdictional oversight, and access and signal spacing.



2.0 EXISTING CONDITIONS

Traffic impacts of the anticipated development were evaluated at key roadways and intersections. These key locations were selected because they provide primary access to the regional road system and will likely be the primary roadways when the area develops. This section identifies these roadways and intersections, and documents their existing transportation characteristics. Traffic data included roadway geometry, traffic volumes, and functional class.

2.1 Key Roadways

The key roadways selected to analyze future traffic impacts (**Figure 2-1**) include:

1. County State Aid Highway (CSAH) 3 from 65th Street NW to CSAH 4 (Valleyhigh Road)
2. 60th Avenue NW from 85th Street NW to CSAH 4 (Valleyhigh Road)
3. 50th Avenue NW from 85th Street NW to CSAH 4 (Valleyhigh Road)
4. County Road (CR) 112 (18th Avenue NW) from 85th Street NW to 55th Street NW
5. Stonehedge Drive NE Extension from 48th Street NE to CSAH 22 (East Circle Drive NE)
6. 85th Street NW from 60th Avenue NW to CR 112 (18th Avenue NW)
7. CSAH 14 (75th Street NW) from 60th Avenue NW to West TH 52 Frontage Road
8. CSAH 14 (75th Street NW) from East TH 52 Frontage Road to CR 112 (18th Avenue NW)
9. 65th Street NW from CSAH 3 to 50th Avenue NW
10. 55th Street NW from CSAH 3 to CSAH 22 (West Circle Drive NW)
11. 55th Street NW / 48th Street NE from CR 112 (18th Avenue NW) to CSAH 11 (55th Avenue NE)
12. CSAH 4 (Valleyhigh Road) from CSAH 3 to 50th Avenue NW

Associated transportation characteristics are displayed on **Table 2-1**. In the table, the roadways are broken down into segments to provide a more detailed evaluation of future traffic impacts. The existing roadway section and pavement types are documented, along with the existing average daily traffic (ADT) and functional classification. ADT volumes were obtained from Year 2002 Mn/DOT traffic flow maps. These traffic volumes are also illustrated on **Figure 2-2**, and are limited to state and county roadways. It should be noted that East and West Circle Drive were analyzed as part of another study, and therefore were not included in this report. However, a summary of select intersections from the *Circle Drive Traffic and Access Management Plan* is located in **Section 3.5**.

Figure 2-3 displays the recommended functional classification of existing and future roadways as designated in ROCOG's Long Range Thoroughfare Plan (August 2003). For the purposes of this EAW, the functional classification designations were extended beyond the ROCOG plan limits to take into consideration future development throughout the entire Project Area. By placing these designations on these roadways now, access management guidelines and roadway design standards (see **Section 4.4**) will be used as development occurs and roadways are planned and constructed. It should be noted that with the existing development, roadways are not acting as designated. For example, 60th Avenue NW is currently acting as a local collector, providing access to farmsteads. However, the functional class map displays this roadway as an upgraded expressway, indicating this roadway will be an expressway in the future.

It should also be noted that not all roadways designated on the functional class map were selected as key roadways. Additionally in some areas, key roadways were selected that hold no functional class designation. For example, the City's existing thoroughfare plan extends to 75th Street NW while this study evaluates key roadways north of this boundary. In the future, the City will likely expand their thoroughfare map to include this area, using this document to assist in the process.

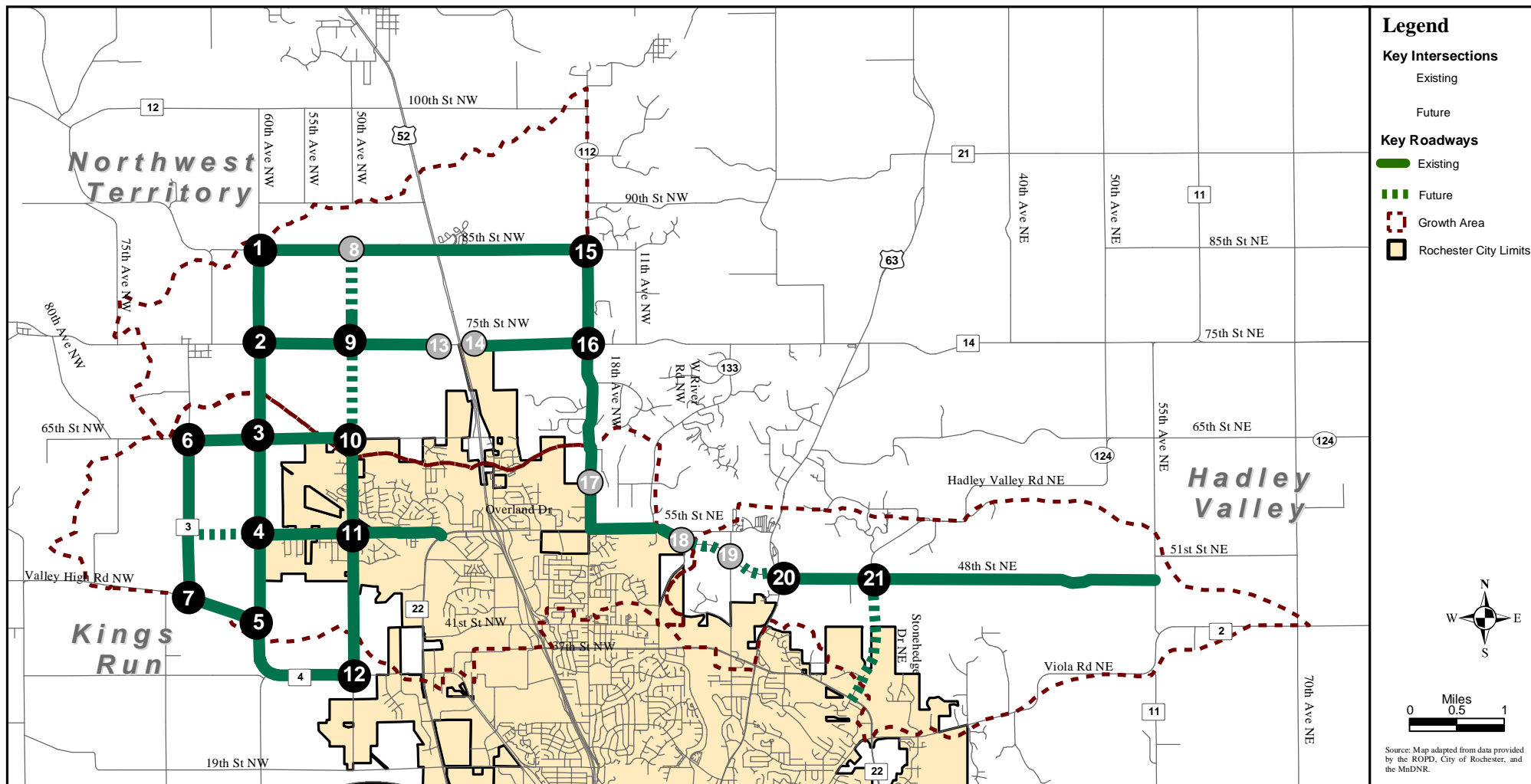


Table 2-1
Existing Roadway Segment Characteristics

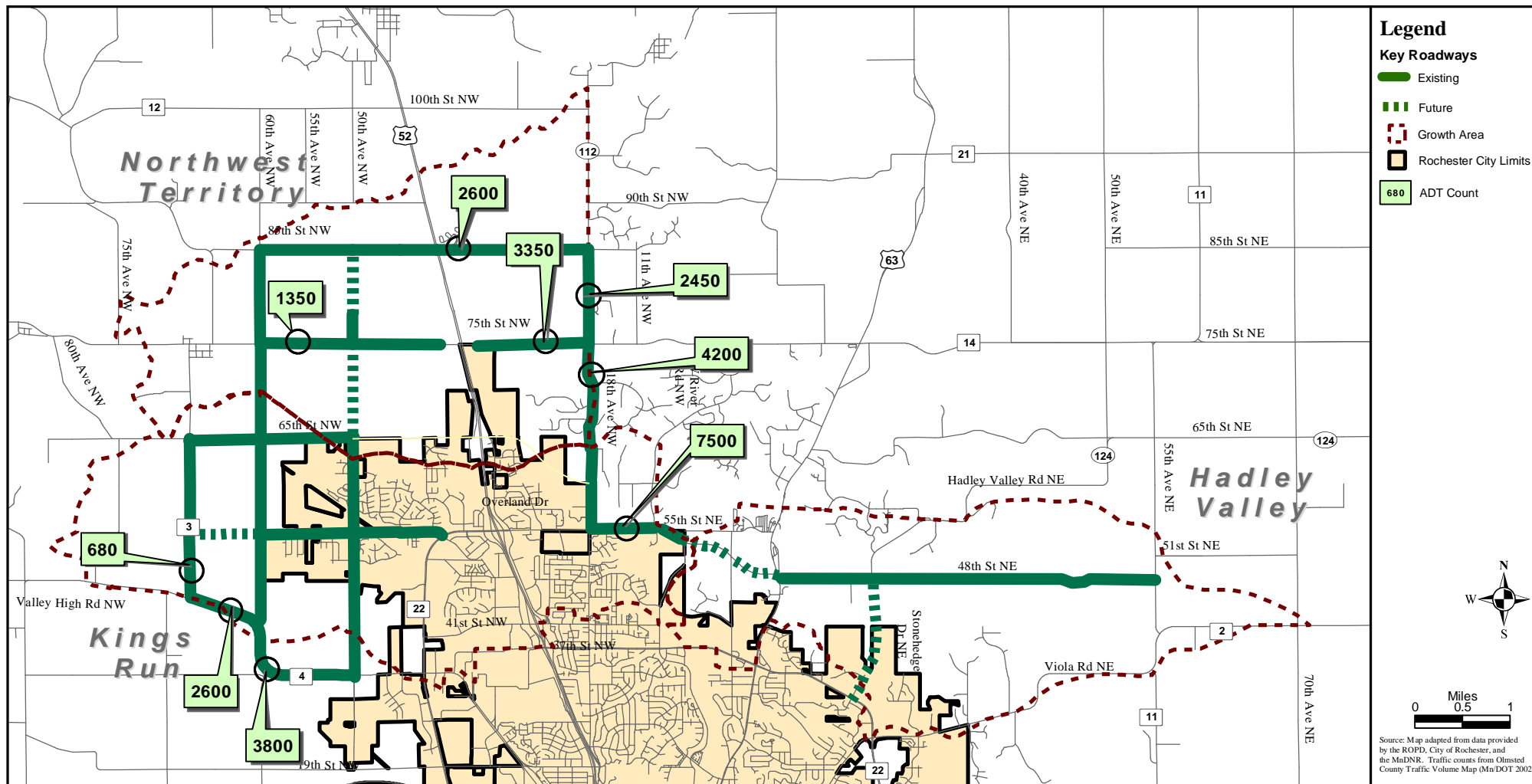
Segment	Start Point	End Point	Roadway Section	Pavement Type	Existing ADT (Year 2002)	Roadway Classification
CSAH 3	65th St NW	55th St NW	2-Lane	Paved	680	Upgrade Arterial
CSAH 3	55th St NW	CSAH 4 (Valleyhigh Rd)	2-Lane	Paved	680	Upgrade Arterial
60th Ave NW	85th St NW	CSAH 14 (75th St NW)	2-Lane	Gravel	na	na
60th Ave NW	CSAH 14 (75th St NW)	65th St NW	2-Lane	Gravel	na	Upgrade Expressway
60th Ave NW	65th St NW	55th St NW	2-Lane	Gravel/Paved	na	Upgrade Expressway
60th Ave NW	55th St NW	CSAH 4 (Valleyhigh Rd)	2-Lane	Paved	na	Upgrade Expressway
50th Ave NW	85th St NW	CSAH 14 (75th St NW)	na	na	na	na
50th Ave NW	CSAH 14 (75th St NW)	65th St NW	na	na	na	Upgrade Arterial
50th Ave NW	65th St NW	55th St NW	3-Lane	Paved	na	Upgrade Arterial
50th Ave NW	55th St NW	CSAH 4 (Valleyhigh Rd)	3-Lane/2-Lane	Gravel/Paved	na	Upgrade Arterial
CR 112 (18th Ave NW)	85th St NW	CSAH 14 (75th St NW)	2-Lane	Paved	2,450	Upgrade Arterial
CR 112 (18th Ave NW)	CSAH 14 (75th St NW)	Overland Dr	2-Lane	Paved	4,200	Upgrade Arterial
CR 112 (18th Ave NW)	Overland Dr	55th St NW	2-Lane	Paved	4,200	Upgrade Arterial
Hadley Valley Rd Southern Ext	48th St NE	CSAH 22 (East Circle Dr)	na	na	na	Future Collector
85th St NW	60th Ave NW	50th Ave NW	2-Lane	Paved	na	na
85th St NW	50th Ave NW	TH 52	2-Lane	Paved	na	na
85th St NW	TH 52	CR 112 (18th Ave NW)	2-Lane	Paved	2,600	Upgrade Arterial
CSAH 14 (75th St NW)	60th Ave NW	50th Ave NW	2-Lane	Paved	1,350	Upgrade Expressway
CSAH 14 (75th St NW)	50th Ave NW	West TH 52 Frontage Rd	2-Lane	Paved	1,350	Upgrade Expressway
CSAH 14 (75th St NW)	East TH 52 Frontage Rd	CR 112 (18th Ave NW)	2-Lane	Paved	3,350	Upgrade Arterial
65th St NW	CSAH 3	60th Ave NW	2-Lane	Gravel	na	Upgrade Arterial
65th St NW	60th Ave NW	50th Ave NW	2-Lane	Paved	na	Upgrade Arterial
55th St NW	CSAH 3	60th Ave NW	na	na	na	Future Arterial
55th St NW	60th Ave NW	50th Ave NW	2-Lane	Paved	na	Upgrade Arterial
55th St NW	50th Ave NW	CSAH 22 (West Circle Dr)	2-Lane	Paved	na	Upgrade Arterial
55th St NW	CR 112 (18th Ave NW)	CR 133 (West River Rd)	4-Lane	Paved	7,500	Upgrade Expressway
55th St / 48th St NE	CR 133 (West River Rd)	East River Rd	na	na	na	Upgrade Expressway
55th St / 48th St NE	East River Rd	TH 63	na	na	na	Upgrade Expressway
48th St NE	TH 63	Hadley Valley Rd	2-Lane	Paved	na	Existing Collector
48th St NE	Hadley Valley Rd	CSAH 11	2-Lane	Gravel	na	Upgrade Collector
CSAH 4 (Valleyhigh Rd)	CSAH 3	60th Ave NW	2-Lane	Paved	2,600	Upgrade Arterial
CSAH 4 (Valleyhigh Rd)	60th Ave NW	50th Ave NW	2-Lane	Paved	3,800	Upgrade Arterial

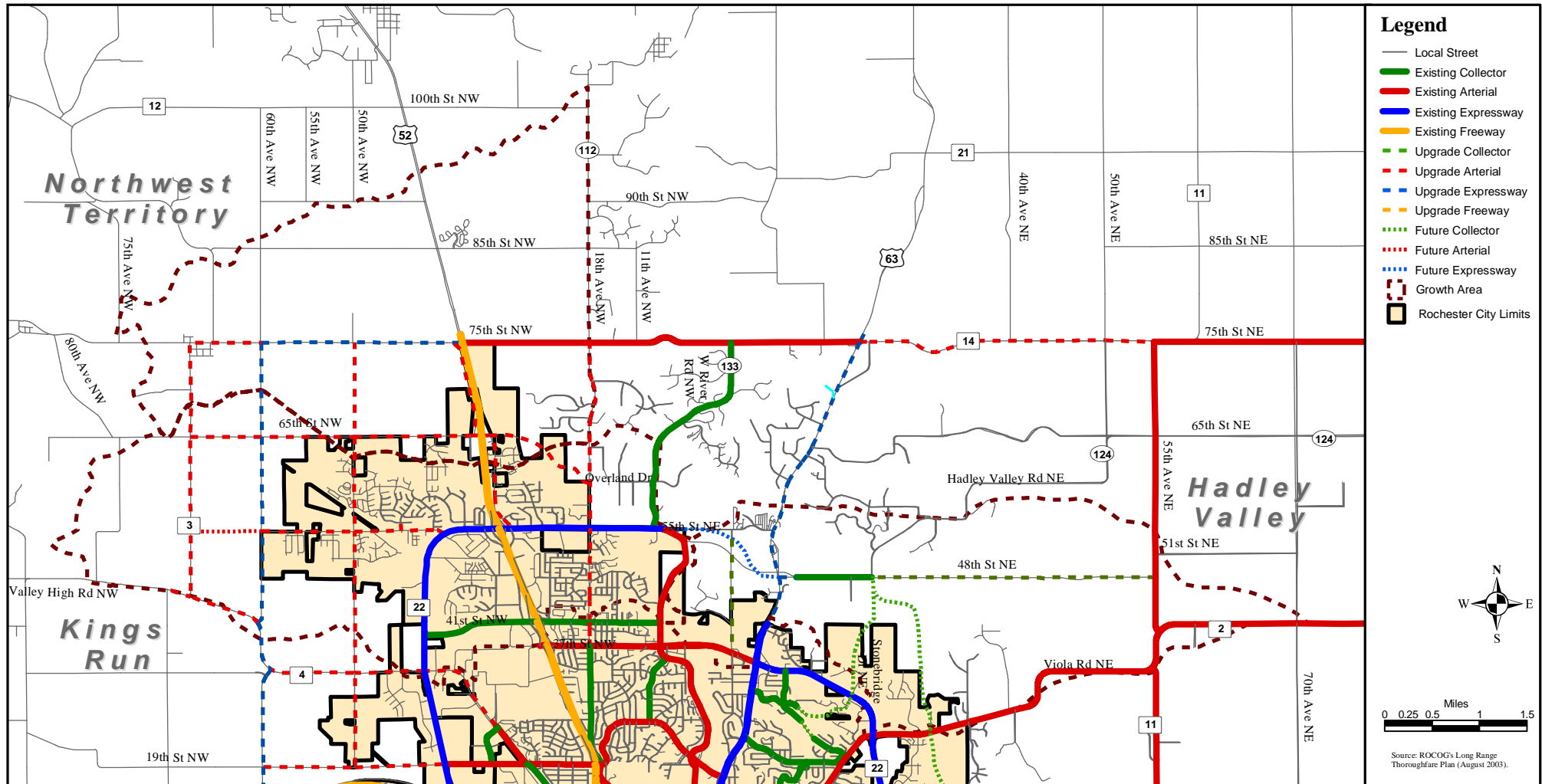
Note: na = Not Available

Source: Roadway Classification is from ROCOG Long Range Thoroughfare Plan (August 2003)

Average Daily Traffic (ADT) is from Olmsted County Traffic Volume Map (MnDOT 2002)

CSAH 3 runs north-south through the western portion of Kings Run. From 75th Street NW to CSAH 4, the roadway is a two-lane paved roadway with ADT volumes of 680 vehicles per day (vpd). The roadway currently acts as a rural minor collector, providing a mix of mobility and access to farmsteads. However, the roadway will be upgraded to an arterial as development occurs.





60th Avenue NW acts as a local road, providing access to farmsteads. In the future, this roadway will be upgraded to an expressway. The roadway is a two-lane facility, running north-south through the Kings Run and Northwest Territory growth areas. North of 55th Street NW the roadway is gravel. From 55th Street NW to CSAH 4 the roadway is paved. Traffic counts were not available on this roadway.

50th Avenue NW is a north-south roadway in the Kings Run growth area. The roadway acts as an urban collector from 65th Street NW to CSAH 4, providing mobility and access to urban development. However, the Corridor will be upgraded to an arterial in the future. Near areas of existing development, the roadway is a three-lane paved facility. The southern section of the roadway is a two-lane gravel facility. A future extension of 50th Avenue NW is planned between 85th Street NW to 65th Street NW. Traffic counts were not available on this roadway.

CR 112 (18th Avenue NW) is located about one-mile east of US 52. The roadway runs north-south and forms the eastern boundary of the Northwest Territory and Kings Run areas. The two-lane paved facility carries approximately 4,200 vpd. As an arterial, the main purpose of the roadway will be mobility, limiting access to existing suburban development.

The proposed Stonehedge Drive NE Extension was added to the roadway network for review. The roadway connects existing CR 124 (Hadley Valley Road) and CSAH 22. When constructed, this roadway will act as a collector, providing mobility and access.

85th Street NW is a two-lane paved roadway running east-west across the Northwest Territory. West of TH 52, 85th Street NW is functional classed as a local roadway. Existing traffic count data was not available on this roadway.

CSAH 14 (75th Street NW) is a two-lane paved section, located in the Northwest Territory. The existing ADT volumes range from approximately 1,350 vpd west of TH 52 to 3,350 vpd east of TH 52. The existing roadway acts as a rural major collector with access to TH 52, providing east-west mobility and access to farmsteads. The Corridor will be upgraded to an expressway from 60th Avenue NW to TH 52. The rest of the Corridor will be upgraded to an arterial.

65th Street NW is an east-west roadway near the Northwest Territory and Kings Run boundaries. The roadway is a two-lane facility, paved to the east of 60th Avenue NW and gravel to the west. This roadway will be upgraded to an arterial in the future. However, it currently behaves as a local road from CSAH 3 to 50th Avenue NW providing access to farmsteads. East of 50th Avenue NW, the roadway is currently classified as a collector. Traffic count data was not available at these locations.

55th Street NW is an east-west roadway in Kings Run. It connects 60th Avenue NW to the west and West River Road to the east. The roadway is a two-lane paved facility west of TH 52 and a four-lane divided facility to the east. The ADT volume is approximately 7,500 vpd east of CR 112. The functional class will be upgraded to an arterial west of CSAH 22 and an expressway from CSAH 22 to TH 63. The section of 55th Street between CSAH 3 and 60th Avenue NW currently does not exist, but was added to the network for evaluation purposes. In addition, a future connection of 55th Street NW and 48th Street NE will be added to the network. This addition runs northwest-southeast in the Hadley Valley growth area, linking West River Road to TH 63.

48th Street NE is classified as an upgrade collector, running east-west from TH 63 to CSAH 11 (55th Avenue NE) across Hadley Valley. The roadway has a two-lane cross-section that is paved between TH 63 and Hadley Valley Road and gravel to the east. Traffic count data was not available for this roadway.

CSAH 4 (Valley High Road) is located on the southern boundary of Kings Run. The roadway is an east-west facility, carrying 2,600 vpd. It is a two-lane paved facility that will be upgraded to an arterial.

2.2 Key Intersections

Twenty-one intersections were selected for analysis because they connect two roadways that provide the primary access to the regional road system and will likely be major intersections when the area develops. The vast majority of traffic exiting and entering the project area would have to use at least one of these intersections. The location of these key intersections is shown on **Figure 2-1**. Numbers on the figure correspond to the key intersections as listed below:

1. 60th Avenue NW / 85th Street NW
2. 60th Avenue NW / CSAH 14 (75th Street NW)
3. 60th Avenue NW / 65th Street NW
4. 60th Avenue NW / 55th Street NW
5. 60th Avenue NW / CSAH 4 (Valleyhigh Rd NW)
6. CSAH 3 / 65th Street NW
7. CSAH 3 / CSAH 4 (Valleyhigh Rd NW)
8. 50th Avenue NW (to be built) / 85th Street NW
9. 50th Avenue NW (to be expanded) / CSAH 14 (75th Street NW)
10. 50th Avenue NW / 65th Street NW
11. 50th Avenue NW / 55th Street NW
12. 50th Avenue NW / CSAH 4 (Valleyhigh Rd)
13. TH 52 West Frontage Road (to be built) / CSAH 14 (75th Street NW)
14. TH 52 East Frontage Road (to be built) / CSAH 14 (75th Street NW)
15. CR 112 (18th Avenue NW) / 85th Street NW
16. CR 112 (18th Avenue NW) / CSAH 14 (75th Street NW)
17. CR 112 (18th Avenue NW) / Overland Dr (to be built)
18. CR 133 (West River Rd) / 55th Street NW / 48th Street NE (to be built)
19. East River Road / 55th Street NE (to be built)
20. TH 63 / 48th Street NE
21. CR 124 (Hadley Valley Rd) / 48th Street NE






















































The existing lane geometry and traffic control for each intersection is shown on **Table 2-2**. Seven of the twenty-one intersections, 50th Avenue NW / 85th Street NW, 50th Avenue NW / CSAH 14 (75th Street NW), TH 52 East Frontage Road / CSAH 14 (75th Street NW), TH 52 West Frontage Road / CSAH 14 (75th Street NW), CR 112 (18th Avenue NW) / Overland Dr, CR 133 (West River Rd) / 55th Street NW / 48th Street NE, and East River Road / 55th Street NE do not currently exist, but were included so they could be evaluated in the future condition. All the existing intersections are controlled by STOP signs. The CSAH 3 / 65th Street NW, 50th Avenue NW / 55th Street NW, and CR 112 (18th Avenue NW) / 85th Street NW intersections are All-Way STOP, while the remaining intersections have Thru-STOP control.

2.3 Existing Land Use

Currently, the project area is largely undeveloped, consisting mostly of grasslands, agricultural land, and farmsteads. Based on data in Table 91 of the *RWRP Expansion – Trunk Sewer Extension EAW*, approximately 62 percent of Kings Run is developed land, 33 percent is developable land, and 5 percent consists of undeveloped areas where development is constrained by environmental features such as water bodies, floodplains, slopes greater than 26 percent and hydric (wetland) soils. The Northwest Territory consists of approximately 21 percent developed land, 72 percent developable land, and 7 percent land that has potential constraints to development. Approximately 35 percent of land within Hadley Valley is developed land, 52 percent developable land, and 13 percent land has potential constraints to development. Currently, an estimated 160,000 vehicle trips are generated in the project area per day. According to ROCOG data, existing land use in the project area includes the following:

- 906 Suburban Multi-Family Dwelling Units
- 2,927 Suburban Single Family Dwelling Units
- 585 Urban Multi-Family Dwelling Units
- 310 Urban Single Family Dwelling Units
- 1,145 Elementary School Students
- 1,627 Secondary School Students
- 680 Group Home Rooms
- 401 Hotel Rooms
- 72,000 Square Feet Social Services
- 223,000 Square Feet Big Box Retail
- 178,000 Square Feet Shopping Center
- 35,000 Square Feet High Intensity Retail
- 1,398,000 Square Feet Office
- 763,000 Square Feet General Commercial
- 4,084,000 Square Feet Industrial
- 300 Public Facility Seats
- 148 Acres Developed Parks
- 345 Acres Undeveloped Parks

Table 2-2
Existing Intersection Geometry and Traffic Control

Intersection Number	Intersection	West Approach	East Approach	South Approach	North Approach	Traffic Control
1	60th Ave NW/85th St NW	 STOP	 STOP	 Thru	 Thru	Thru-STOP
2	60th Ave NW/CSAH 14 (75th St NW)	 Thru	 Thru	 STOP	 STOP	Thru-STOP
3	60th Ave NW/65th St NW	 STOP	 STOP	 Thru	 Thru	Thru-STOP
4	60th Ave NW/55th St NW	n.a.	 STOP	 Thru	 Thru	Thru-STOP
5	60th Ave NW/CSAH 4 (Valleyhigh Rd)	 Thru	 Thru	n.a.	 STOP	Thru-STOP
6	CSAH 3/65th St NW	 STOP	 STOP	 STOP	 STOP	All-Way STOP
7	CSAH 3/CSAH 4 (Valleyhigh Rd NW)	 Thru	 Thru	n.a.	 STOP	Thru-STOP
8	50th Ave NW (to be built)/85th St NW	n.a.	n.a.	n.a.	n.a.	n.a.
9	50th Ave NW (to be expanded)/CSAH 14 (75 St NW)	 Thru	 Thru	n.a.	 STOP	Thru-STOP
10	50th Ave NW/65th St NW	 Thru	 Thru	 STOP	n.a.	Thru-STOP
11	50th Ave NW/55th St NW	 STOP	 STOP	 STOP	 STOP	All-Way STOP
12	50th Ave NW/CSAH 4 (Valleyhigh Rd)	 Thru	 Thru	 STOP	 STOP	Thru-STOP
13	TH 52 West Frontage Rd (to be built)/CSAH 14 (75th St NW)	n.a.	n.a.	n.a.	n.a.	n.a.
14	TH 52 East Frontage Rd(to be built)/CSAH 14 (75th St NW)	n.a.	n.a.	n.a.	n.a.	n.a.
15	CR 112 (18th Ave NW)/85th St NW	 STOP	 STOP	 STOP	 STOP	All-Way STOP
16	CR 112 (18th Ave NW)/CSAH 14 (75th St NW)	 Thru	 Thru	 STOP	 STOP	Thru-STOP
17	CR 112 (18th Ave NW)/Overland Dr. (to be built)	n.a.	n.a.	n.a.	n.a.	n.a.
18	CR 133 (West River Rd)/55th St NW/48th St NW (to be built)	n.a.	n.a.	n.a.	n.a.	n.a.
19	East River Rd/55th St/48th St (to be built)	n.a.	n.a.	n.a.	n.a.	n.a.
20	TH 63/CR 124 (48th St)	n.a.	 STOP	 Thru	 Thru	Thru-STOP
21	CR 124 (Hadley Valley Rd)/48th St NE	 Thru	 Thru	n.a.	 STOP	Thru-STOP

Note: n.a. = Not Applicable Source: Howard R. Green Company

3.0 FUTURE CONDITIONS

The purpose of this section is to identify traffic impacts associated with future development within the project area. For the purposes of completing the *RWRP Expansion – Trunk Sewer Extension EAW*, a future land use scenario was established for the Kings Run, the Northwest Territory, and Hadley Valley growth areas. The land use scenario was created to represent the highest intensity of land use expected at full build-out, which is estimated to occur by Year 2045. Land use for the rest of the City of Rochester was as projected for the Year 2035. As a result, the Year 2035 development scenario was selected for the project area as the hypothetical “worst-case” scenario. It assumes that the Kings Run, Northwest Territory, and Hadley Valley growth areas will reach full build-out by Year 2035, when in actuality this development is expected to happen incrementally over the next 40 years.

3.1 Year 2035 Land Development Scenario

In order to analyze traffic impacts for the Year 2035, a land use scenario was developed by the Rochester-Olmsted Planning Department (ROPD) for the project area. The number and type of vehicle trips vary with differing types of land use. For example, a shopping center is likely to have larger traffic volumes than an industrial development. However, a larger percentage of the trips to an industrial development are work-related and take place during the morning and evening rush hours, while shopping centers attract traffic throughout the day. Future land development within the project area is expected to occur for full build-out as follows:

- 8,200 Suburban Multi-Family Dwelling Units
- 33,675 Suburban Single Family Dwelling Units
- 6,525 Urban Multi-Family Dwelling Units
- 5,000 Elementary School Students
- 5,300 Secondary School Students
- 1500 Group Home Rooms
- 1,000 Hotel Rooms
- 430,175 Square Feet Social Services
- 567,800 Square Feet Big Box Retail
- 1,298,950 Square Feet Shopping Center
- 121,350 Square Feet High Intensity Retail
- 4,340,000 Square Feet Office
- 1,849,800 Square Feet General Commercial
- 5,131,650 Square Feet Industrial
- 5,000,000 Square Feet Mayo Clinic Development
- 1,000 Acres Developed Park

In order to analyze the traffic impacts associated with this land development scenario, the area was divided into segments called traffic analysis zones (TAZ). Land use was distributed into each TAZ to determine how many vehicle trips would enter or exit the zone per day. These trips were applied to a computer representation of Rochester’s roadway network contained in the Rochester-Olmsted County Council of Government’s (ROCOG) Regional Travel Demand Model. The distribution of land use was completed through joint efforts of ROCOG staff and the land use planning consultant Hoisington Kogler Group, Inc. (HKGI). In general, the distribution of future project area land use to TAZ’s was completed by utilizing current comprehensive plans and zoning information while accounting for existing land uses and environmental constraints. **Figure 3-1** depicts the location of these TAZ’s in the project area. A breakdown of the land use by TAZ is located in **Appendix A**.



Figure 3-1

Traffic Analysis Zones Rochester, MN

3.2 Year 2035 Traffic Forecasts

Year 2035 traffic forecasts for a complete build-out of the growth areas were developed using the ROCOG Travel Demand Model. Forecasts were done for each of the key roadway segments listed in **Section 2.1** and for daily turning movements at each of the key intersections listed in **Section 2.2**. It should be noted that the daily traffic forecasts were taken directly from the model, and no adjustments were made to account for deviations between the corresponding base year traffic counts and modeled assignments. This is because base year traffic counts for the project area were largely unavailable.

Year 2035 ADT volumes are illustrated on **Figure 3-2** and **Table 3-1**. Traffic is expected to grow rapidly with development. An additional 700,000 daily vehicles trips (making a total of 860,000 daily vehicle trips) are forecasted within the project area. Generally, traffic volumes on key roadways range from 11,100 to 52,100 vpd. Traffic volumes on CSAH 14 increased from 1,350 to 19,200 vpd near 60th Avenue NW and from 3,350 to 46,700 vpd near CR 112. On CR 112, traffic volumes are expected to increase from 4,200 to 23,100 vpd north of Overland Drive and 39,400 vpd to the south. On the southwest section of the Kings Run growth area, traffic volumes will also increase significantly. CSAH 4 is expected to grow from 2,600 to 26,400 vpd.

Daily intersection turning movements for each of the key intersections were forecasted using ROCOG's Travel Demand Model. A peak hour factor of 8 percent, a typical rate for similar developments, was used to estimate PM peak hour turning movement volumes. These volumes are displayed on **Table 3-2**. It should be noted that because the turning movements were estimated from daily volumes, they do not reflect the directionality that would be expected during the PM peak hour. In addition, these volumes may be overstated because collector roadways were not included in the model. Collector roadways are expected at one-half mile spacing between minor arterials.

3.3 Future Functional Classification

In 2003, ROGOG updated its Long Range Thoroughfare Plan as a part of their long range planning efforts. The development of the Kings Run, the Northwest Territory, and Hadley Valley growth areas were taken in consideration when developing a future functional class network, represented as upgrade or future roadways on **Figure 2.3**. Future functional classification is discussed further in **Section 4.1**.

3.4 Future Operations Analysis and Determination of Deficiencies

3.4.1 Analysis Methodology

The approach to the traffic operations analysis is derived from the established methodologies documented in the *Highway Capacity Manual* (TRB, 2000). *The Highway Capacity Manual* (HCM) contains a series of analysis techniques that are used to evaluate the operation of transportation facilities under specific conditions.

The results of an HCM analysis are typically presented in the form of a letter grade (A-F) that provides a qualitative estimate of the operational efficiency or effectiveness. The letter grade determined by the HCM analysis is referred to as level of service (LOS). By definition, LOS A conditions represent high-quality operations (i.e., motorists experience very little delay or interference) and LOS F conditions represent very poor operations (i.e., extreme delay or severe congestion). The LOS of an intersection or road segment is based on three main elements:

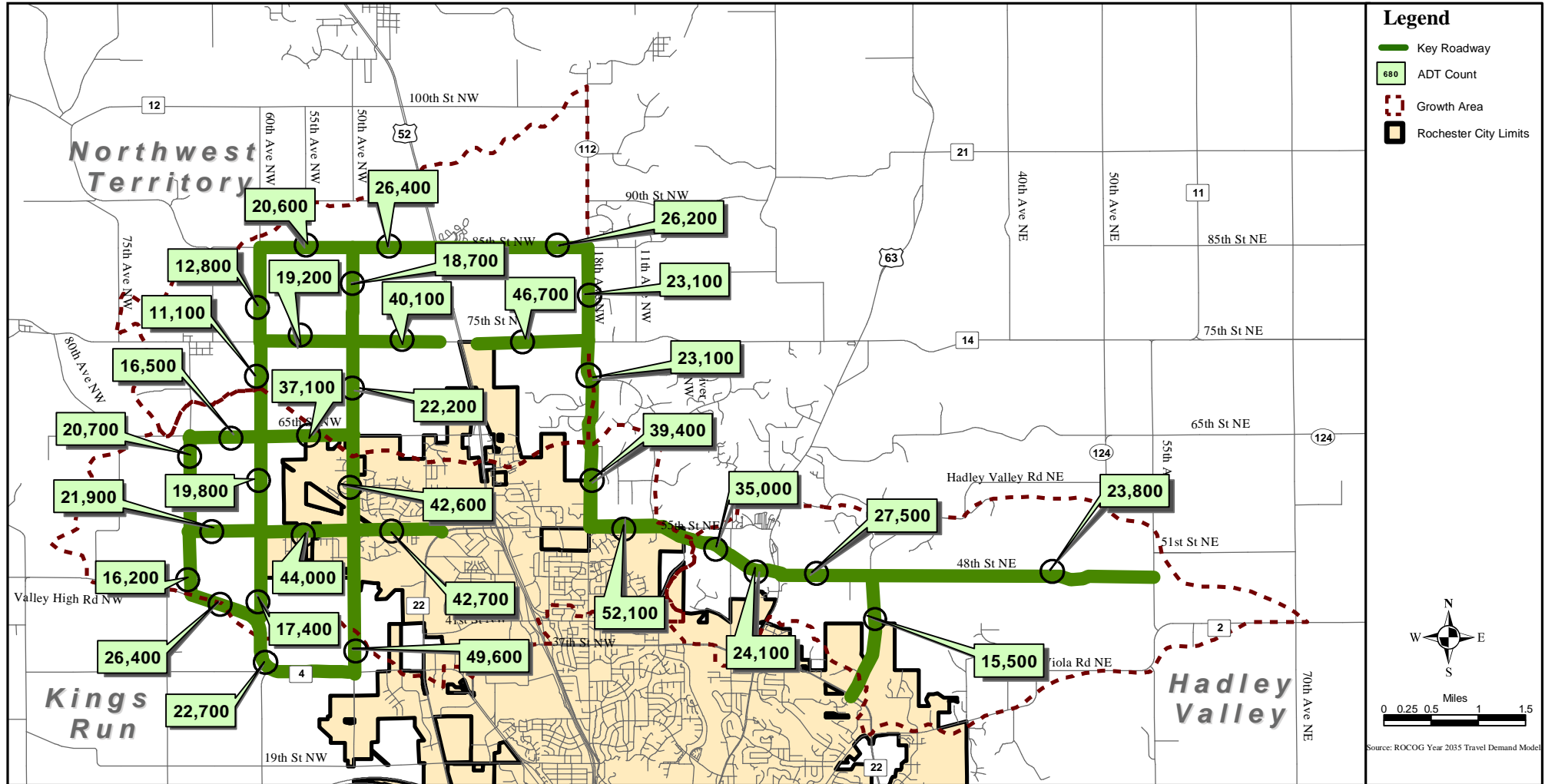


Table 3-1
Year 2035 Average Daily Traffic Forecasts

Segment	Start Point	End Point	Existing (Year 2002) ADT	Year 2035 ADT
CSAH 3	65th St NW	55th St NW	680	20,700
CSAH 3	55th St NW	CSAH 4 (Valleyhigh Rd)	680	16,200
60th Ave NW	85th St NW	CSAH 14 (75th St NW)	na	12,800
60th Ave NW	CSAH 14 (75th St NW)	65th St NW	na	11,100
60th Ave NW	65th St NW	55th St NW	na	19,800
60th Ave NW	55th St NW	CSAH 4 (Valleyhigh Rd)	na	17,400
50th Ave NW	85th St NW	CSAH 14 (75th St NW)	na	18,700
50th Ave NW	CSAH 14 (75th St NW)	65th St NW	na	22,200
50th Ave NW	65th St NW	55th St NW	na	42,600
50th Ave NW	55th St NW	CSAH 4 (Valleyhigh Rd)	na	49,600
CR 112 (18th Ave NW)	85th St NW	CSAH 14 (75th St NW)	2,450	23,100
CR 112 (18th Ave NW)	CSAH 14 (75th St NW)	Overland Dr	4,200	23,100
CR 112 (18th Ave NW)	Overland Dr	55th St NW	4,200	39,400
Hadley Valley Rd Southern Ext	48th St NE	CSAH 22 (East Circle Dr)	na	15,500
85th St NW	60th Ave NW	50th Ave NW	na	20,600
85th St NW	50th Ave NW	TH 52	na	26,400
85th St NW	TH 52	CR 112 (18th Ave NW)	2,600	26,200
CSAH 14 (75th St NW)	60th Ave NW	50th Ave NW	1,350	19,200
CSAH 14 (75th St NW)	50th Ave NW	West TH 52 Frontage Rd	1,350	40,100
CSAH 14 (75th St NW)	East TH 52 Frontage Rd	CR 112 (18th Ave NW)	3,350	46,700
65th St NW	CSAH 3	60th Ave NW	na	16,500
65th St NW	60th Ave NW	50th Ave NW	na	37,100
55th St NW	CSAH 3	60th Ave NW	na	21,900
55th St NW	60th Ave NW	50th Ave NW	na	44,000
55th St NW	50th Ave NW	CSAH 22 (West Circle Dr)	na	42,700
55th St NW	CR 112 (18th Ave NW)	CR 133 (West River Rd)	7,500	52,100
55th St / 48th St NE	CR 133 (West River Rd)	East River Rd	na	35,000
55th St / 48th St NE	East River Rd	TH 63	na	24,100
48th St NE	TH 63	Hadley Valley Rd	na	27,500
48th St NE	Hadley Valley Rd	CSAH 11	na	23,800
CSAH 4 (Valleyhigh Rd)	CSAH 3	60th Ave NW	2,600	26,400
CSAH 4 (Valleyhigh Rd)	60th Ave NW	50th Ave NW	3,800	22,700

Source:

MnDOT Traffic Counts - City of Rochester (2000) and Olmsted County (2002)
 ROCOG Year 2035 Travel Demand Model

Table 3-2
Year 2035 PM Peak Hour Turning Movement Volumes

Intersection	West Approach			East Approach			South Approach			North Approach		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
60th Ave NW/85th St NW	--	--	--	6127	--	67	--	518	6118	63	330	--
60th Ave NW/CSAH 14 (75th St NW)	2549	4836	187	2798	4782	5	238	3541	2924	5	3465	2276
60th Ave NW/65th St NW	52	5104	3223	1733	5177	6788	2889	3411	1953	6105	3660	49
60th Ave NW/55th St NW	40	10593	485	2293	8850	5716	1894	3673	1308	6019	3402	40
60th Ave NW/CSAH 4 (Valleyhigh Rd)	1015	7903	3688	1229	7966	1442	4142	6515	939	1850	6506	671
CSAH 3/65th St NW	1807	2400	146	2486	2241	1099	169	4217	2041	2087	3570	1111
CSAH 3/CSAH 4 (Valleyhigh Rd NW)	2746	7505	--	--	8961	4247	--	--	--	4885	--	1503
50th Ave NW (to be built)/85th St NW	7	6919	3540	3123	7318	46	2946	40	3341	49	42	10
50th Ave NW (to be built)/CSAH 14 (75 St NW)	6	8726	785	3545	8490	3595	967	5669	3179	3916	5476	6
50th Ave NW/65th St NW	219	11957	6058	5924	11933	2724	6676	8179	5495	3190	7660	232
50th Ave NW/55th St NW	2632	11698	8034	2243	12810	6770	4871	12256	2627	6583	10402	3970
50th Ave NW/CSAH 4 (Valleyhigh Rd)	3434	5935	1866	653	6694	5712	2177	7993	2177	6809	6327	2570
TH 52 West Frontage Road/CSAH 14 (75th St NW)	150	18966	1276	5837	18358	14657	1174	5638	6779	15805	4842	139
TH 52 East Frontage Road (to be built)/CSAH 14 (75th St NW)	13645	15161	20878	42	20728	3876	16338	5697	28	3907	5943	12804
CR 112 (18th Ave NW)/85th St NW	16	4054	6223	3784	4203	2664	6310	3722	3745	2447	3384	37
CR 112 (18th Ave NW)/CSAH 14 (75th St NW)	3762	7285	5376	1399	7048	3943	4293	3801	1789	4229	3009	4311
CR 112 (18th Ave NW)/Overland Dr. (to be built)	2870	--	9398	--	--	--	10564	8698	--	--	9160	2403
CR 133 (West River Rd)/55th St NW/48th St NW (to be built)	--	15514	10532	2034	15346	--	9675	--	2069	--	--	--
East River Road/55th St/48th St (to be built)	3016	10645	3832	1302	10513	178	4254	2612	1287	201	3259	2612
TH 63/CR 124 (48th St)	1219	6962	3951	4853	6556	2355	4026	7189	4589	2148	7434	1412
CR 124 (Hadley Valley Rd)/48th St NE	2138	3556	5105	8338	3541	58	5211	5537	8297	59	5640	2105

Source: ROCOG Year 2035 Travel Demand Model

Note: The PM peak hour traffic volumes assume 8% of the daily traffic volumes.

- Roadway Geometry (i.e. How many lanes are there?)
- Traffic Control (i.e. Is there a signal or stop sign?)
- Traffic Volume (i.e. How many vehicles are using this intersection/road segment?)

It is important to note that LOS is defined differently for the two HCM analysis techniques applied in this Study. The arterial roadway analysis focuses on the average daily volume to capacity ratio along a roadway segment, and the intersection analysis focuses on delay caused by the PM peak hour critical movements. It is therefore possible to have an efficient intersection located along a poorly operating roadway segment, or a poorly operating intersection along an otherwise free-flowing arterial.

The arterial roadway LOS was determined by conducting a planning level analysis. This analysis consists of comparing the average daily flow rates on a roadway segment to the LOS breakdown of ADT volumes for that facility type. **Figure 3-3** provides a breakdown of roadway LOS by peak hourly directional flow for the different facility types analyzed as part of this study. The figure was based on capacity information found in the HCM 2000.

A planning level analysis was completed using critical movements to estimate intersection level of service. The critical movement at an intersection is the movement with the highest volume of conflicting vehicle movements that cause vehicle delay. A critical movement at an intersection is defined as either a high volume of traffic making the same movement or opposing vehicle movements that are in conflict with each other.

In critical movement analysis, left turn volumes are a critical factor in estimating LOS. The critical movement for each leg was calculated by adding left turn movements to the opposing through movement. In order to compute the estimated LOS for the entire intersection, the critical movements were added for each phase. Therefore, the worst movement of the north and south legs were added to the worst movement of the east and west leg. **Table 3-3** estimates the intersection level of service using critical movement volumes.

Although LOS A conditions represent the best possible level of traffic flow, it is not feasible to build urban roadways and intersections to such high standards. Therefore, in the Rochester area, the ROCOG has set the index of congestion for major urban roadways and intersections at the LOS C/D boundary while the congestion index for secondary roadways and intersections is the LOS D/E boundary. This index indicates that LOS C conditions during the peak hour of traffic would be considered acceptable for major urban roadways and intersections, whereas LOS D conditions would be considered congested and deficient. Likewise, for secondary roadways and intersections, LOS D conditions during the peak hour of traffic would be considered acceptable whereas LOS E conditions would be considered congested and deficient. The following is a summary of the index of congestion for the roadways and intersections analyzed as a part of this study:

- Primary Roadways and Intersections (Expressways and Arterials): LOS C/D boundary
- Secondary Roadways and Intersections (Collectors and Local Roads): LOS D/E boundary

All roadway segments will be evaluated as a primary roadway, with the exception of 48th Street NE. As a collector, 48th Street NE will be evaluated as a secondary roadway. The intersection of CR 124 / 48th Street NE is considered a secondary intersection, while all other intersections will be evaluated as a primary roadway.

Figure 3-3
Estimated Segment Level of Service

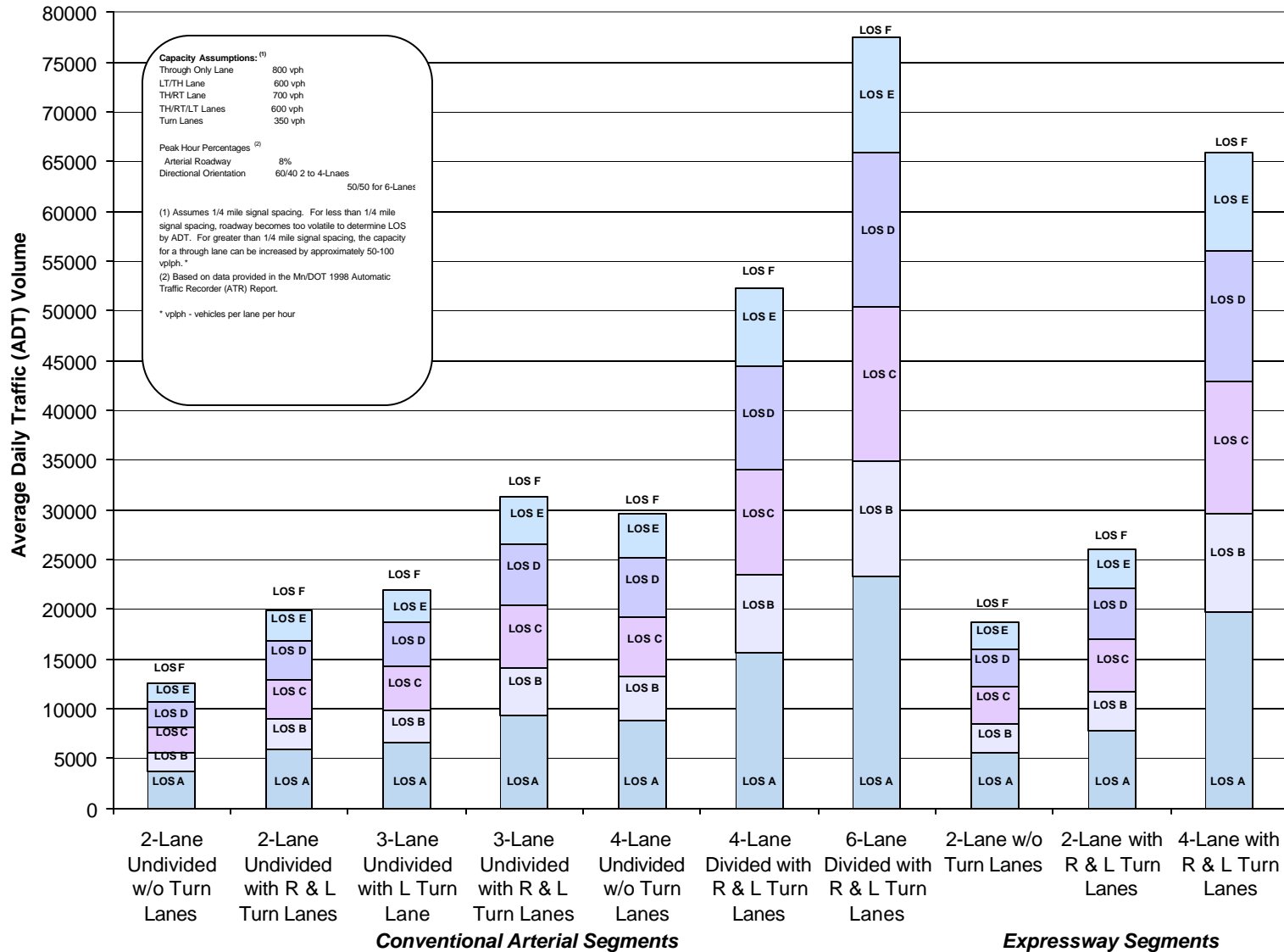


Table 3-3
Intersection Critical Movement Level of Service

Intersection	Critical Movement Volume Thresholds
A	<825
B	>825 - 965
C	>965 - 1100
D	>1100 - 1225
E	>1225 - 1400
F	1400

Source: Highway Capacity Manual
Howard R. Green Company

3.4.2 Year 2035 Level of Service Summary and Identification of Deficiencies

Table 3-4 is a summary of the expected future traffic operations for the thirty-two key roadway segments. This analysis assumed a paved roadway section with the existing geometry. It should be noted that all but two roadway sections currently are two-lane facilities. In conditions where the roadway currently does not exist, a two-lane facility was assumed. Comparing Year 2035 ADT volumes to **Figure 3-3**, all roadways are forecasted to operate at LOS E or F assuming only the existing road network is in place. The only exception was 60th Avenue NW between CSAH 14 and 65th Street NW, which operated at LOS C. All remaining roadways are considered deficient for full build-out of the project area with the existing geometry.

The results of the intersection critical movement analysis are displayed on **Figure 3-4**. The following five intersections are expected to operate at LOS A or B:

- 60th Avenue NW / 85th Street NW
- 60th Avenue NW / CSAH 14 (75th Street NW)
- CSAH 3 / 65th Street NW
- CSAH 3 / CSAH 4 (Valleyhigh Road NW)
- 50th Avenue NW (to be built) / 85th Street NW

With the existing geometry, the remaining sixteen intersections are expected to operate at LOS D, E, or F. These sixteen intersections are considered deficient using the guidelines noted above.

3.4.3 Year 2035 Development Improvements

The purpose of this section is to identify future development improvements based on the forecasted development. Improvements include recommended roadway cross-sections necessary to eliminate the roadway deficiencies for the 2035 development scenario and identify intersections that are expected to meet PM peak hour traffic signal warrants.

Table 3-4
Year 2035 Segment Level of Service

Segment	Start Point	End Point	Existing ADT ⁽¹⁾	Year 2035 Forecasted ADT ⁽²⁾	Roadway Classification ⁽³⁾	Existing Roadway Section	LOS ⁽⁴⁾
CSAH 3	65th St NW	55th St NW	680	20,700	Upgrade Arterial	2-Lane	F
CSAH 3	55th St NW	CSAH 4 (Valleyhigh Rd)	680	16,200	Upgrade Arterial	2-Lane	F
60th Ave NW	85th St NW	CSAH 14 (75th St NW)	na	12,800	na	2-Lane	F
60th Ave NW	CSAH 14 (75th St NW)	65th St NW	na	11,100	Upgrade Expressway	2-Lane	C
60th Ave NW	65th St NW	55th St NW	na	19,800	Upgrade Expressway	2-Lane	F
60th Ave NW	55th St NW	CSAH 4 (Valleyhigh Rd)	na	17,400	Upgrade Expressway	2-Lane	E
50th Ave NW	85th St NW	CSAH 14 (75th St NW)	na	18,700	na	na	F
50th Ave NW	CSAH 14 (75th St NW)	65th St NW	na	22,200	Upgrade Arterial	na	F
50th Ave NW	65th St NW	55th St NW	na	42,600	Upgrade Arterial	3-Lane	F
50th Ave NW	55th St NW	CSAH 4 (Valleyhigh Rd)	na	49,600	Upgrade Arterial	3-Lane/2-Lane	F
CR 112 (18th Ave NW)	85th St NW	CSAH 14 (75th St NW)	2,450	23,100	Upgrade Arterial	2-Lane	F
CR 112 (18th Ave NW)	CSAH 14 (75th St NW)	Overland Dr	4,200	23,100	Upgrade Arterial	2-Lane	F
CR 112 (18th Ave NW)	Overland Dr	55th St NW	4,200	39,400	Upgrade Arterial	2-Lane	F
Hadley Valley Rd Southern Ext	48th St NE	CSAH 22 (East Circle Dr)	na	15,500	Future Collector	na	F
85th St NW	60th Ave NW	50th Ave NW	na	20,600	na	2-Lane	F
85th St NW	50th Ave NW	TH 52	na	26,400	na	2-Lane	F
85th St NW	TH 52	CR 112 (18th Ave NW)	2,600	26,200	Upgrade Arterial	2-Lane	F
CSAH 14 (75th St NW)	60th Ave NW	50th Ave NW	1,350	19,200	Upgrade Expressway	2-Lane	F
CSAH 14 (75th St NW)	50th Ave NW	West TH 52 Frontage Rd	1,350	40,100	Upgrade Expressway	2-Lane	F
CSAH 14 (75th St NW)	East TH 52 Frontage Rd	CR 112 (18th Ave NW)	3,350	46,700	Upgrade Arterial	2-Lane	F
65th St NW	CSAH 3	60th Ave NW	na	16,500	Upgrade Arterial	2-Lane	F
65th St NW	60th Ave NW	50th Ave NW	na	37,100	Upgrade Arterial	2-Lane	F
55th St NW	CSAH 3	60th Ave NW	na	21,900	Future Arterial	na	F
55th St NW	60th Ave NW	50th Ave NW	na	44,000	Upgrade Arterial	2-Lane	F
55th St NW	50th Ave NW	CSAH 22 (West Circle Dr)	na	42,700	Upgrade Arterial	2-Lane	F
55th St NW	CR 112 (18th Ave NW)	CR 133 (West River Rd)	7,500	52,100	Upgrade Expressway	4-Lane	F
55th St / 48th St NE	CR 133 (West River Rd)	East River Rd	na	35,000	Upgrade Expressway	na	F
55th St / 48th St NE	East River Rd	TH 63	na	24,100	Upgrade Expressway	na	F
48th St NE	TH 63	Hadley Valley Rd	na	27,500	Existing Collector	2-Lane	F
48th St NE	Hadley Valley Rd	CSAH 11	na	23,800	Upgrade Collector	2-Lane	F
CSAH 4 (Valleyhigh Rd)	CSAH 3	60th Ave NW	2,600	26,400	Upgrade Arterial	2-Lane	F
CSAH 4 (Valleyhigh Rd)	60th Ave NW	50th Ave NW	3,800	22,700	Upgrade Arterial	2-Lane	F

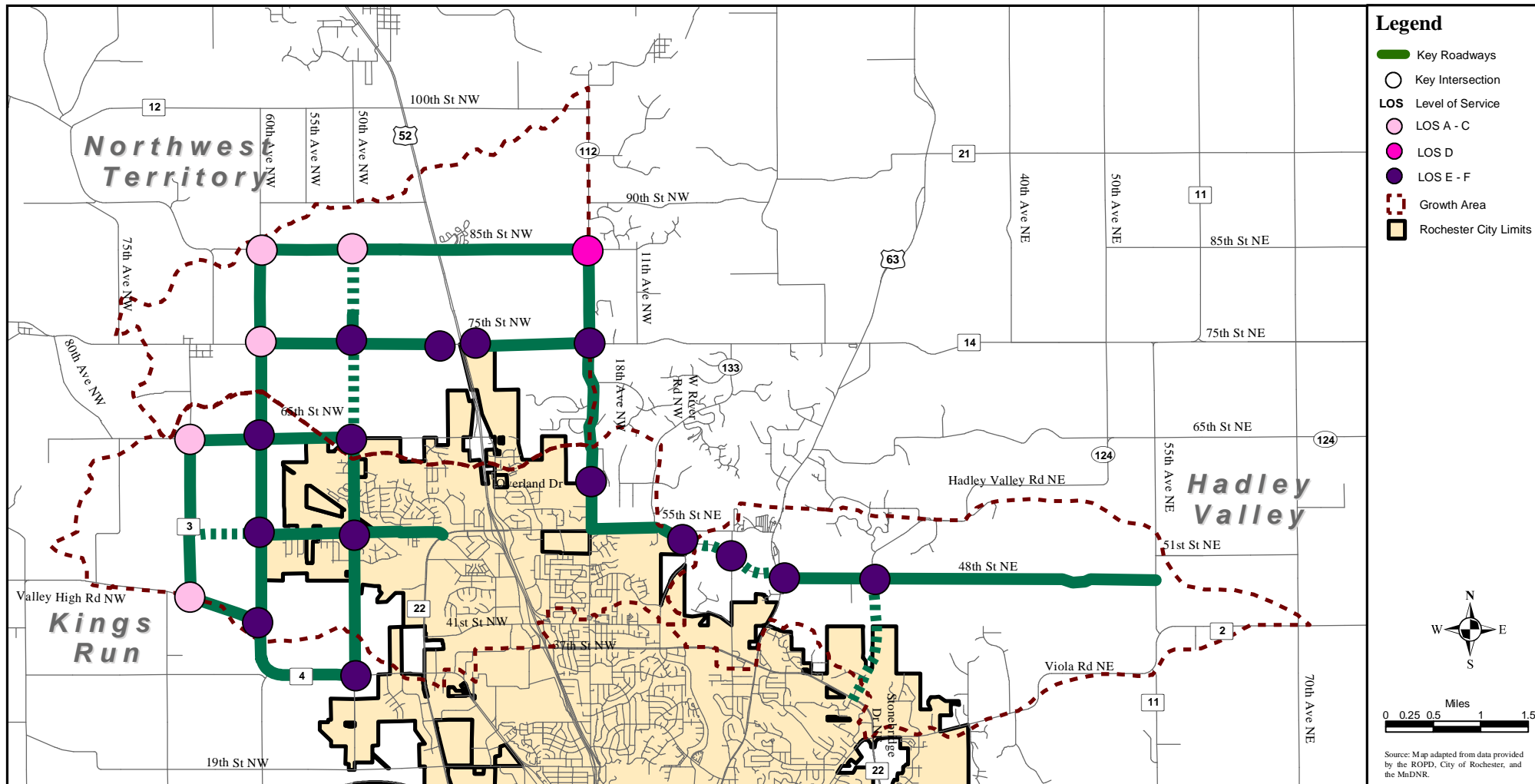
Notes:

(1) MnDOT Traffic Counts - City of Rochester (2000) and Olmsted County (2002).

(2) ROCOG Year 2035 Travel Demand Model.

(3) ROCOG Long Range Thoroughfare Plan (August 2003). Roadway sections without a classification are outside of the ROCOG's long range planning boundaries.

(4) Primary roadways (expressways and arterials) are considered deficient at the LOS C/D boundary. Secondary roadways are considered deficient at the LOS D/E boundary. LOS assumes a paved roadway section, using the existing geometry. A two-lane section is assumed for roadways that currently do not exist.



It should be noted that recommended roadway sections should be used at this time for estimating future right-of-way needs. Recall, the Year 2035 development scenario examined for the project area is a hypothetical “worst-case” scenario. It assumes that the Kings Run, Northwest Territory, and Hadley Valley growth areas will reach full build-out by Year 2035 when, in actuality, this development is expected to happen incrementally over the next 40 years. Therefore, implementation of all improvements is not expected by Year 2035. The timing and magnitude of the improvements will be dependent on the size, type, and location of the developments that occur each year both inside and outside of the project area. More detailed corridor studies are necessary to determine the design of potential improvements. The City of Rochester’s right-of-way guidance is included in **Section 4.4** along with additional design guidance.

3.4.3.1 Roadway Segments

As noted in the previous section, thirty-one of the thirty-two key roadway sections are expected to be deficient with full build-out of the project area. **Table 3-5** and **Figure 3-5** show a summary of the segment cross-section required to meet ROCOG’s LOS guidelines. Recall the goal is LOS C/D for primary roadways and LOS D/E for secondary roadways.

With the addition of turn lanes, 60th Avenue NW north of 65th Street NW could remain a two-lane facility in the future. However, this corridor will be improved to an expressway so a four-lane section with turn lanes is recommended for consistency. All additional roadways will also require additional right-of-way. Six-lane facilities are forecasted to be needed at 50th Avenue NW, CR 112 (18th Avenue NW), 65th Street NW, and 55th Street NW in order to operate above LOS D. However, existing development along 50th Avenue NW will limit the corridor to a four-lane section. Other roadways are forecasted to be 3-lane or 4-lane facilities. It should be noted that these results are based upon LOS analysis only. Roadway cross-sections may be changed to provide consistency with the rest of the corridor. For example, sections of 60th Avenue NW are expected to have adequate operations as a two-lane facility, but as a part of the future expressway system, the design should be a four-lane facility to provide consistency.

3.4.3.2 Intersections

A traffic signal warrant analysis was completed at all twenty-one key intersections. For the PM peak hour, all intersections are expected to meet these warrants for a traffic signal at full build-out of the growth areas, with the exception of 60th Avenue NW / 85th Street NW. The results of the analyses are included in Appendix B. Remember that the development scenario examined here is a hypothetical scenario. The timing and intensity of additional development in the project area will dictate when, where, and what roadway enhancements are needed.

3.4.3.3 Monitoring Locations

The proposed development within Kings Run, the Northwest Territory, and Hadley Valley are expected to occur incrementally of the next 40 years. Therefore, implementation of all improvements is expected to vary over time. The time and magnitude of the improvements will be dependent on the location and type of development that occurs each year. Development-specific environmental assessment worksheets (EAW) will need to be completed by Developments meeting mandatory EAW thresholds to determine environmental and traffic impacts. At the time of the EAW, locations should be selected to monitor traffic volumes. This information can then be used to estimate the need for further study of roadway segment improvements and new traffic signals.

Table 3-5
Year 2035 Estimated Roadway Improvements

Segment	Start Point	End Point	Year 2035 Forecasted ADT ⁽¹⁾	Roadway Classification ⁽²⁾	Improved Section	LOS ⁽³⁾
CSAH 3	65th St NW	55th St NW	20,700	Upgrade Arterial	4-Lane with R & L Turn Lanes	B
CSAH 3	55th St NW	CSAH 4 (Valleyhigh Rd)	16,200	Upgrade Arterial	3-Lane with R & L Turn Lanes	C
60th Ave NW	85th St NW	CSAH 14 (75th St NW)	12,800	na	3-Lane with R & L Turn Lanes	B
60th Ave NW	CSAH 14 (75th St NW)	65th St NW	11,100	Upgrade Expressway	4-Lane Divided with R & L Turn Lanes	A
60th Ave NW	65th St NW	55th St NW	19,800	Upgrade Expressway	4-Lane Divided with R & L Turn Lanes	B
60th Ave NW	55th St NW	CSAH 4 (Valleyhigh Rd)	17,400	Upgrade Expressway	4-Lane Divided with R & L Turn Lanes	A
50th Ave NW	85th St NW	CSAH 14 (75th St NW)	18,700	na	4-Lane with R & L Turn Lanes	B
50th Ave NW	CSAH 14 (75th St NW)	65th St NW	22,200	Upgrade Arterial	4-Lane with R & L Turn Lanes	B
50th Ave NW	65th St NW	55th St NW	42,600	Upgrade Arterial	4-Lane Divided with R & L Turn Lanes ⁽⁴⁾	D
50th Ave NW	55th St NW	CSAH 4 (Valleyhigh Rd)	49,600	Upgrade Arterial	4-Lane Divided with R & L Turn Lanes ⁽⁴⁾	E
CR 112 (18th Ave NW)	85th St NW	CSAH 14 (75th St NW)	23,100	Upgrade Arterial	4-Lane with R & L Turn Lanes	B
CR 112 (18th Ave NW)	CSAH 14 (75th St NW)	Overland Dr	23,100	Upgrade Arterial	4-Lane with R & L Turn Lanes	B
CR 112 (18th Ave NW)	Overland Dr	55th St NW	39,400	Upgrade Arterial	6-Lane Divided with R & L Turn Lanes	C
Hadley Valley Rd Southern Ext	48th St NE	CSAH 22 (East Circle Dr)	15,500	Future Collector	3-Lane with R & L Turn Lanes	C
85th St NW	60th Ave NW	50th Ave NW	20,600	na	4-Lane with R & L Turn Lanes	B
85th St NW	50th Ave NW	TH 52	26,400	na	4-Lane with R & L Turn Lanes	C
85th St NW	TH 52	CR 112 (18th Ave NW)	26,200	Upgrade Arterial	4-Lane with R & L Turn Lanes	C
CSAH 14 (75th St NW)	60th Ave NW	50th Ave NW	19,200	Upgrade Expressway	4-Lane Divided with R & L Turn Lanes	A
CSAH 14 (75th St NW)	50th Ave NW	West TH 52 Frontage Rd	40,100	Upgrade Expressway	6-Lane Divided with R & L Turn Lanes	B
CSAH 14 (75th St NW)	East TH 52 Frontage Rd	CR 112 (18th Ave NW)	46,700	Upgrade Arterial	6-Lane Divided with R & L Turn Lanes	C
65th St NW	CSAH 3	60th Ave NW	16,500	Upgrade Arterial	3-Lane with R & L Turn Lanes	C
65th St NW	60th Ave NW	50th Ave NW	37,100	Upgrade Arterial	6-Lane Divided with R & L Turn Lanes	C
55th St NW	CSAH 3	60th Ave NW	21,900	Future Arterial	4-Lane with R & L Turn Lanes	B
55th St NW	60th Ave NW	50th Ave NW	44,000	Upgrade Arterial	6-Lane Divided with R & L Turn Lanes	C
55th St NW	50th Ave NW	CSAH 22 (West Circle Dr)	42,700	Upgrade Arterial	6-Lane Divided with R & L Turn Lanes	C
55th St NW	CR 112 (18th Ave NW)	CR 133 (West River Rd)	52,100	Upgrade Expressway	6-Lane Divided with R & L Turn Lanes	C
55th St / 48th St NE	CR 133 (West River Rd)	East River Rd	35,000	Upgrade Expressway	4-Lane Divided with R & L Turn Lanes	C
55th St / 48th St NE	East River Rd	TH 63	24,100	Upgrade Expressway	4-Lane Divided with R & L Turn Lanes	B
48th St NE	TH 63	Hadley Valley Rd	27,500	Existing Collector	4-Lane with R & L Turn Lanes	C
48th St NE	Hadley Valley Rd	CSAH 11	23,800	Upgrade Collector	4-Lane with R & L Turn Lanes	C
CSAH 4 (Valleyhigh Rd)	CSAH 3	60th Ave NW	26,400	Upgrade Arterial	4-Lane with R & L Turn Lanes	C
CSAH 4 (Valleyhigh Rd)	60th Ave NW	50th Ave NW	22,700	Upgrade Arterial	4-Lane with R & L Turn Lanes	B

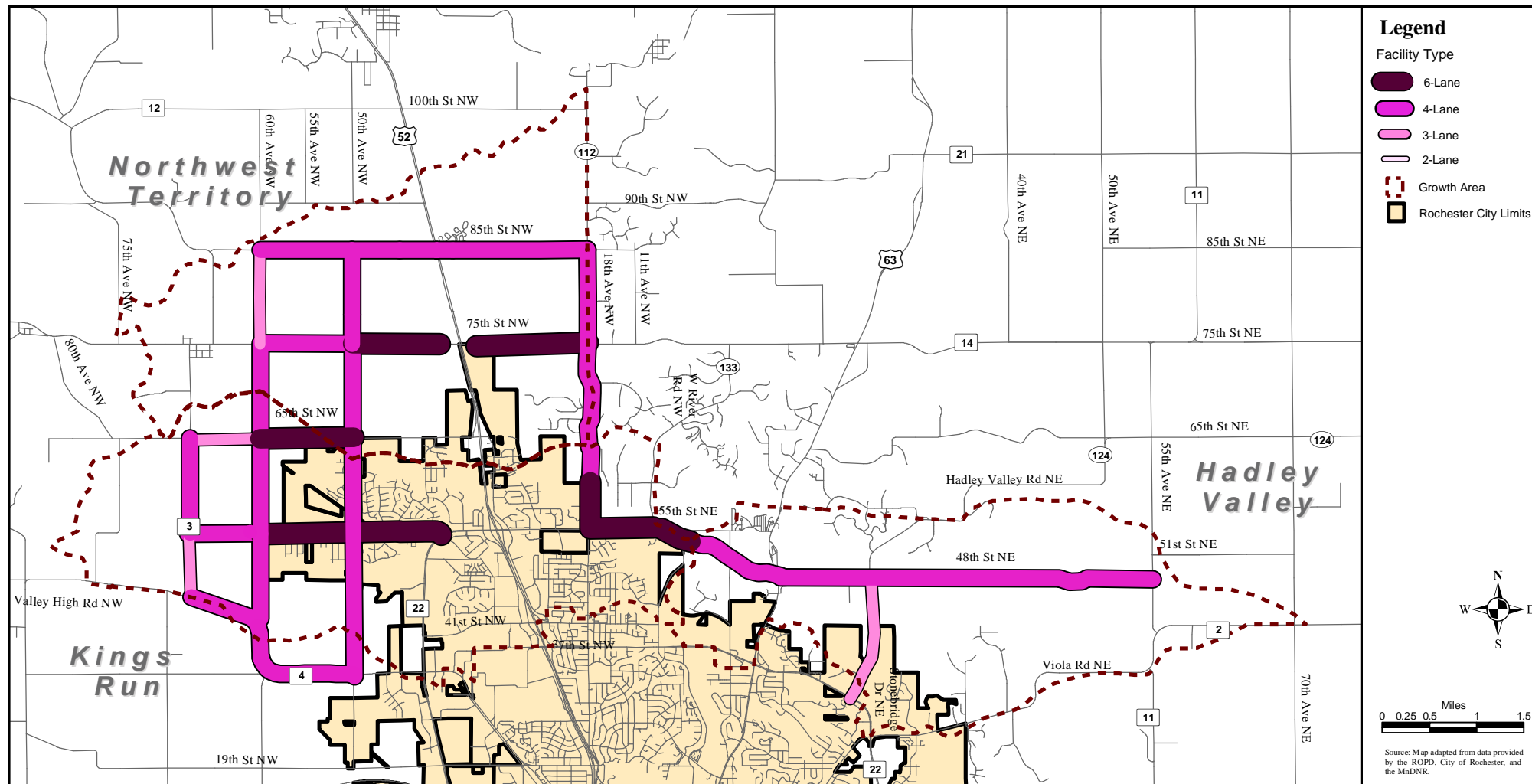
Notes:

(1) ROCOG Year 2035 Travel Demand Model.

(2) ROCOG Long Range Thoroughfare Plan (August 2003)

(3) Primary roadways (expressways and arterials) are considered deficient at the LOS C/D boundary. Secondary roadways are considered deficient at the LOS D/E boundary.

(4) Cross-sections are limited within these segments due to existing right-of-way constraints.



3.5 Coordination with Previous Studies

3.5.1 65th Street NW Interchange Justification Request

The 65th Street NW Interchange Justification Request was completed by ROCOG and the City of Rochester in July 2003. The study documents the traffic impacts of a folded diamond interchange at the junction of TH 52 / 65th Street NW, and compares the results to an overpass scenario. Because the future 65th Street NW Interchange with TH 52 is not currently funded, this EAW study evaluated worst-case traffic and roadway impacts based on the 65th Street NW Interchange not being constructed. If this interchange is funded and constructed in the future, it would likely reduce some of the expected traffic impacts and roadway improvements described in the Mitigative Strategies section of this EAW. The main traffic changes expected with a 65th Street NW Interchange are as follows:

- A reduction in traffic volumes is expected on south ramps of the 55th Street NW interchange.
- A reduction in traffic volumes is expected between the east ramps and the east frontage road on 55th Street NW.
- A reduction in traffic volumes is expected on Bandel Road between 55th and 65th Streets NW.
- An increase of traffic volumes is expected on the TH 52 mainline between 55th and 65th Streets NW.

The study noted that the 55th Street NW interchange could experience deficient operations if 65th Street NW is only an overpass of TH 52. According to the study, the reduction in traffic on 55th Street NW due to the 65th Street NW interchange will improve operations along 55th Street NW to LOS C. The magnitude of roadway improvements to 55th Street NW will likely be lessened by the addition of an interchange at TH 52 and 65th Street NW because of the traffic diversion to that interchange.

As mentioned previously for the EAW study, the operations analysis was completed using a scenario that assumed an overpass at TH 52 / 65th Street NW intersection. For comparison purposes, the ROCOG Travel Demand Model was run for Year 2035 using the full build-out land use (including Kings Run, the Northwest Territory, and Hadley Valley) and a 65th Street NW interchange. It should be noted that traffic volumes documented in the 65th Street NW Interchange Justification Request only included full build-out scenario of the Northwest Territory.

The results of this analysis were consistent with that shown in the Interchange Justification Report. Additionally, traffic volumes increased (53,400 vpd to 57,200 vpd) on 65th Street NW west of TH 52 and decreased (26,500 vpd to 23,900 vpd) on Overland Drive. However, these changes have minimal impact on the roadway operations. For both scenarios, 65th Street NW is expected to operate at LOS D between 50th Avenue NW and TH 52 if constructed as a 6-lane arterial. Overland Drive is expected to operate at a LOS C as a 4-lane arterial.

Additional intersection analysis was completed on 65th Street NW and Overland Drive. Impacts of the interchange to 50th Avenue NW / 65th Street NW and CR 112 (18th Avenue NW) / Overland Drive are negligible. Both will remain at LOS C with turning lane improvements and the recommended roadway geometry noted on **Table 3-5**. However, the additional traffic generated by the development within the Kings Run and Hadley Valley growth areas will impact operations near the 65th Street Interchange. The West Frontage Road / 65th Street NW intersection is expected to operate at LOS D and the East Frontage Road / 65th Street NW intersection is expected to operate at LOS E when constructed with dual left turn lanes.

3.5.2 Circle Drive Traffic and Access Management Plan

The *Circle Drive Traffic and Access Management Plan* was completed by Parsons Transportation Group in January 2002. Circle Drive is an expressway, forming a loop around much of the City of Rochester. To improve the mobility of the Corridor, Olmsted County and the City of Rochester developed intersection and roadway operational goals. In order to reach these goals, a one-half mile spacing of traffic signals is desirable to promote traffic progression. The study evaluates the existing and future operations on the Circle Drive Corridor, and makes recommendations to assist in achieving the performance goals. For purposes of this study, the recommendations for two intersections, West Circle Drive / 55th Street NW and East Circle Drive / Rocky Creek Drive / Stonehedge Drive, will be discussed in this section.

West Circle Drive / 55th Street NW

55th Street NW connects with West Circle Drive, tying in as the northwestern leg. At the intersection, 55th Street is a two-lane facility and West Circle Drive is a four-lane divided facility. The southeastern leg of the intersection provides access to a retail development. A traffic signal currently controls the intersection.

The *Circle Drive Traffic and Access Management Plan* recommends merging the existing 55th Street NW access with 48th Street NW, tying in to West Circle Drive about 1000 feet southwest of the existing access. The north approach of the existing 55th Street NW intersection and median would be closed, allowing only right-in / right-out vehicular traffic to enter the retail development via the existing south approach. The new intersection is expected to require a traffic signal, operating at LOS C in Year 2025.

East Circle Drive / Rocky Creek Drive

Long-range plans include the connection of Hadley Valley Road and Rocky Creek Drive via Stonehedge Drive NE at this intersection. This connection is a desirable location for ideal signal spacing, and is forecast to operate at LOS B in Year 2025. In order to operate efficiently, the intersection will require turn lane improvements.

4.0 PLANNING RECOMMENDATIONS AND GUIDELINES

Because of the magnitude of the project area and the uncertainty surrounding future development, the timing and prioritization of identified improvements cannot be accurately estimated. However, planning recommendations can be made based upon the results of the traffic impact analysis. The purpose of this section is to identify the following:

- Future functional classification,-.
- Future jurisdictional oversight,-.
- Future access and signal spacing, and
- Roadway design guidance.

4.1 Future Functional Classification

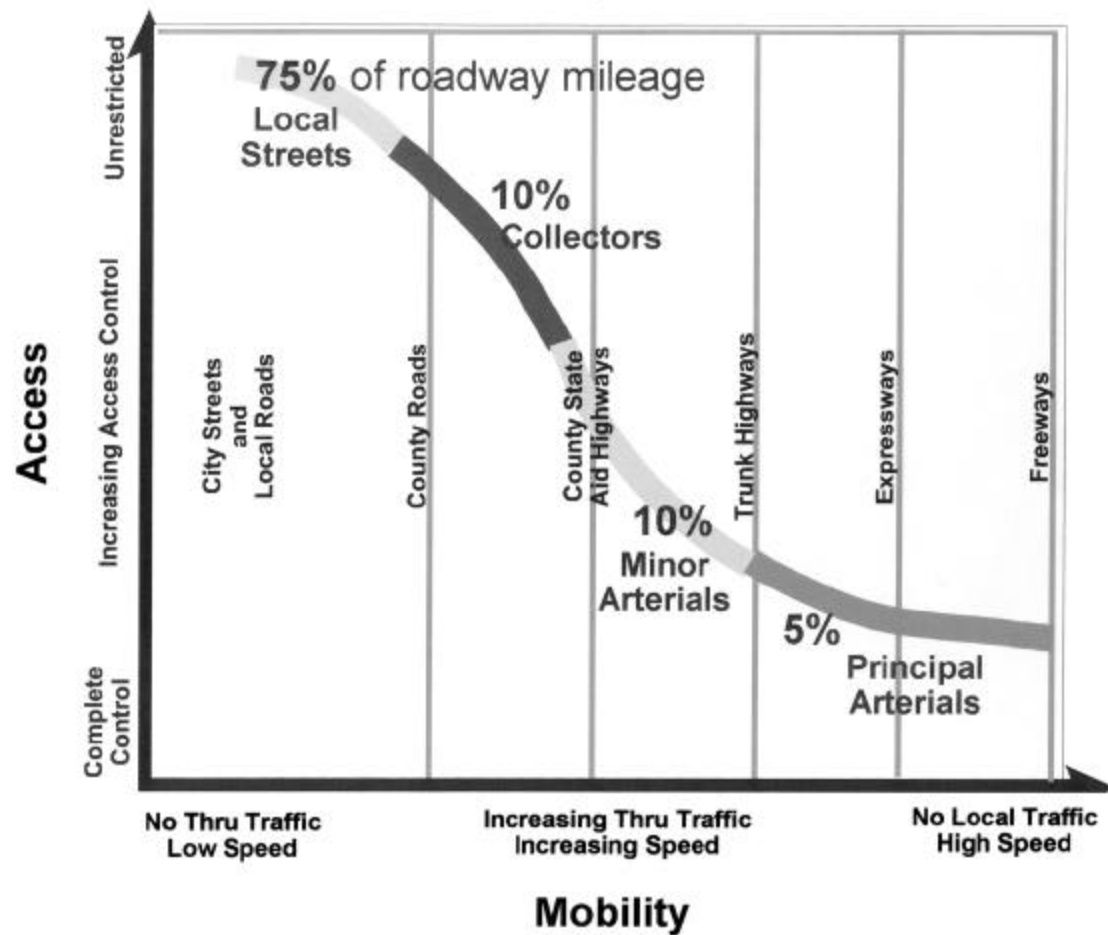
4.1.1 Functional Class Concept

The functional classification system categorizes roadways according to the type of service they provide to the user in an attempt to provide a more efficient and safe transportation network. Roadways serve two major functions: access and mobility. Arterial roadways are designed to move traffic, hence access is managed in order to preserve mobility by limiting the adverse effects caused by slower moving turning vehicles. Local roadways provide a high degree of land access; therefore, these roadways tend to operate at low speeds because of the number of conflicts associated with turning maneuvers at frequent driveways and public street intersections. **Figure 4-1** illustrates the degree to which each of the four components of a typical classified system serves each function. A description of the four components follows:

- *Local Roads* – The primary function of local roads is access to surrounding land uses. Local roads make up most (about 75 percent) of the typical roadway network, and only account for about 15 percent of all vehicle miles traveled. Roadway geometry is typically a two-lane facility, and characteristics include low traffic volumes and speeds.
- *Collectors* – Collectors provide both access and mobility functions, collecting vehicular traffic from local roads and directing it to the arterial system. Collectors make up about 10 percent of the roadway network, and account for about 10 percent of all vehicles miles traveled. Typical roadway geometry includes two-lane or three-lane cross-sections, and characteristics include lower speeds and low to medium traffic volumes.
- *Minor Arterials* – Minor arterials serve both access and mobility functions, with the greater emphasis on mobility. Minor arterials make up about 10 percent of a typical roadway network, and account for about 25 percent of the vehicle miles traveled. Roadways typically have moderate speeds and traffic volumes, and may be up to five lanes in width.
- *Principal Arterials* – The primary function of a principal arterial is mobility; therefore, access to principal arterials is limited. Principal arterials make up the smallest portion of the roadway network (5 percent), but carry about 50 percent of all vehicle miles traveled. These roadways tend to be four or five lanes in urbanized areas, and carry high volumes of traffic traveling at higher speeds.

A properly designed functionally classed roadway network will improve mobility and safety, while minimizing conflicts between land use and traffic speeds and volumes. In addition, the framework helps in the prioritization of roadway improvements and determination of access spacing and traffic control.

Figure 4-1
Access vs. Mobility – The Functional Class Concept



Source: FHWA Publication No. FHWA-RD-91-044 (Nov 1992)

4.1.2 Spacing of Functionally Classed Roadways

Proper spacing between classes of roads is necessary in order to create an efficient functionally classed network. If properly designed, traffic speeds and volumes will fit with the surrounding land use. For example, if a network is created with too much spacing between minor arterials, motorists will use collectors and local roads, increasing traffic volumes in residential areas with high levels of access. If there is too little spacing between arterials, land development will generate demand for access, inconsistent with access management guidelines. The City of Rochester has not developed functional classification spacing guidance. However, **Table 4-1** notes typical spacing guidelines based upon information from the Federal Highway Administration and the Twin Cities Metropolitan Council. As an area develops from rural to urban, the structure of the roadway network should become denser in order to support the increased traffic volumes associated with higher densities of land development.

Table 4-1
Typical Functional Classification Spacing

<i>Development</i>	<u><i>Functional Classification</i></u>			
	Principal Arterials	Minor Arterials	Collectors	Local Streets
Developed Area	2 to 3 Miles	1/4 to 1/2 Miles	1/8 to 1/2 Mile	As Needed to Access Land Uses
Developing Areas	3 to 6 Miles	1 to 2 Miles	1/2 to 1 Miles	As Needed to Access Land Uses
Rural Areas	6 to 12 Miles	4+ Miles	As Needed to Access Land Uses	As Needed to Access Land Uses

Source: Metropolitan Council, Metropolitan Development Guide Appendix F, and Federal Highway Administration Highway Functional Classification

4.1.3 Recommended Year 2035 Functional Classifications

As noted in **Section 2.1** and seen in **Figure 2-3**, ROGOG developed a Long Range Thoroughfare Plan as a part of their long range planning efforts. This plan was created assuming substantial development of the Kings Run, Northwest Territory, and Hadley Valley growth areas. The freeways and expressways include CSAH 14 (between 60th Avenue NE and TH 52), West Circle Drive (CSAH 22), 60th Avenue NW, TH 52, and TH 63; these segments will have the most limited access. As shown, CSAH 3, 50th Avenue NW, CR 112, and 55th Avenue NE are recommended as north-south arterials. East-west arterials include CSAH 14 (75th Street NW except the 2.3 miles of expressway), 65th Street NW, Overland Drive, 55th Street NW, CSAH 4 (Valley High Road NW), and CSAH 2 (Viola Road NE). These roadways will have a primary function of mobility, and access on these roadways will also be limited. When compared to the above guidance, the recommended functional class of 55th Street NW / 48th Street NE west of TH 63 meets this guidance, while the area east of TH 63 does not. This area should be reviewed in more detail to determine if the existing network will support the expected land use.

Collector roadways are typically placed between arterials. Collector roadway placement can vary depending on development plans. However, connections to the minor arterials should be kept at one-half mile spacing. It should be noted that environmental and physical constraints may create limitations in some areas.

4.2 Jurisdictional Oversight

Currently, key roadways listed in the project area are owned and maintained by different agencies, which include Mn/DOT, Olmsted County, the City of Rochester, and various townships. As a part of this study, future jurisdictional oversight recommendations were developed based upon functional class recommendations and spacing of roadways with similar jurisdiction. Trunk Highways will remain under the jurisdiction of Mn/DOT. Almost all of the other principal arterials are currently and should remain the responsibility of Olmsted County. As noted in the previous section, 75th Avenue NW may act as a better principal arterial than CSAH 3. In this case, the County and the City may desire to swap jurisdictional oversight. Three additional roadways are future minor arterials under Olmsted County: CR 118 (18th Avenue NW, CR 133 (West River Road NW), and CR 124 (Hadley Valley Road NE). At this time, 60th Avenue NW from CSAH 14 (75th Street NW) to Valley High Road NW is classified as a future expressway that should come under Olmsted County's jurisdiction at the time it is upgraded. The rest of the roadway network, including minor arterials, collectors, and local roadways, will be overseen by the City of Rochester.

4.3 Access and Signal Spacing

In order for the four components of the functional classification system to serve their designated function, access to other roadways is necessary. For example, the primary function of a principal arterial is to move traffic with typical speed limits of over 45 miles per hour. Limiting the number of accesses allows motorists to drive at these speeds safely. The City of Rochester has developed Access Management Guidelines by functional class. As shown on **Table 4-2**, expressways and arterials have the most limited access, while local roads serve this function with minimal limitation.

Appropriate traffic signal spacing is necessary for a roadway to operate efficiently. ROCOG has not developed regional traffic signal spacing guidelines. However, spacing goals have been developed by local jurisdictions for select corridors as part of previously completed corridor studies. For example, CSAH 22 (West Circle Drive) has a desired traffic signal spacing of one-half mile in order to provide an effective interconnected system. In 2002, Mn/DOT established recommended signal spacing guidelines for different functionally classified roadways. For an urban/urbanizing area, these guidelines are as follows:

- Principal Arterial – ½ mile
- Minor Arterial – ¼ mile
- Collector – ¼ mile

Currently, some of the development within the study area has not followed access guidelines. For example 50th Avenue NW is expected to be a minor arterial in the future. Using the guideline, access spacing should be spaced at 1,200 feet. Existing access is spaced below 500 feet in some locations. All sixteen key intersections analyzed in this study meet the intersection spacing guidelines. Following access and spacing guidelines during future development will reduce future conflicts between land use and traffic volumes and speeds.

4.4 Roadway Design Guidance

Table 4-3 is a summary table of typical design guidelines by functional classification. The table provides an indication of typical design speed, minimum roadway grades, and minimum stopping sight distance. These guidelines should not only be used for the roadways discussed in this report, they should also be

Table 4-2
City of Rochester Access Management Guidelines

<i>Road Classification</i> ¹²	<i>Minimum Separation Between Driveways</i> ⁴	<i>Minimum Separation Between Driveways and Intersecting Streets</i> ⁵
Local and Major Local Residential Streets (Projected traffic <3,000 adt)	8 ft.	35 ft.
Other Local, Major Local Collector, and One-Way Frontage Streets (Projected traffic >3,000 adt to <6,000 adt)	60 ft.	75 ft.
Collector and Frontage Roads (Projected traffic >6,000 adt)	125 ft.	150 ft.
Arterial (Projected traffic <15,000 adt)	400 ft.	480 ft.
Expressway and Arterial (Projected traffic >15,000 adt) ³	1,000 ft.	1,200 ft.

Notes:

¹Roadway types refer to anticipated cross-section based on and are defined Thoroughfare Plan.

²All traffic volumes refer to the functional classification and street design volumes.

³May require installation of turn lanes.

⁴Access separation between driveways shall be measured from edge to edge.

⁵Access separation between a driveway and intersecting street shall be measured from the centerline of the driveway and the nearest point of curvature of the intersecting street.

Source: City of Rochester Land Development Manual

considered as part of overall roadway system planning for the purpose of providing for efficient roadway operation in the future. Instead of setting guidelines for right-of-way width, the City of Rochester prefers to look at each corridor in more detail. As indicated in Rochester's Land Development Manual, right-of-way width is determined by summing the widths of the following roadway features:

- Median Width
- Width of Through Lanes
- Width of Auxiliary Lanes
- Sidewalk Width
- Boulevard Width
- Future Right-of-Way Needs

However, **Table 44** provides a general idea as to how much right-of-way may be needed for future arterials and collectors. It provides a breakdown of recommended right-of-way widths by functional class. As expected, arterials require the most right-of-way to allow for multiple lanes.

Table 4-3
City of Rochester Roadway Design Standards

Functional Classification	Typical Design Speed	Maximum Grade	Maximum Grade within 50 feet of Intersection	Minimum Stopping Sight Distance
Alleys	20 mph	10%	5%	150 feet
Local Street	30 mph	10%	5%	200 feet
Collectors Major Local	35 mph	8%	4%	250 feet
Arterial	45 mph	6%	3%	350 feet
Expressway	55 mph	6%	3%	550 feet

Source: City of Rochester Land Development Manual

Table 4-4
Typical Right-of-Way Widths by Functional Class

Functional Classification	Typical Right-of-Way (feet)
Local Street	50-80
Collectors	60-100
Minor Arterials	80-120
Major Arterials	100-150

Source: Howard R. Green Company

5.0 SUMMARY

This study evaluates the traffic impacts of the development of approximately 11,439 acres (for a total of 21,914 acres) to the north of Rochester as indicated by **Table 9-1** of the *RWRP Expansion – Trunk Sewer Extension EAW*. The growth areas Kings Run, Northwest Territory, and Hadley Valley are expected to reach full build-out by Year 2045. However, the traffic analysis assumed a hypothetical “worst case” scenario of full land development by Year 2035. Twelve key roadways (broken into thirty-two segments for analyses) and twenty-one key intersections listed below were selected for this study because they will provide primary access to the regional road system and will likely be the primary roadways when the area develops.

Key Roadways

- County State Aid Highway (CSAH) 3 from 65th Street NW to CSAH 4 (Valleyhigh Road)
- 60th Avenue NW from 85th Street NW to CSAH 4 (Valleyhigh Road)
- 50th Avenue NW from 85th Street NW to CSAH 4 (Valleyhigh Road)
- County Road (CR) 112 (18th Avenue NW) from 85th Street NW to 55th Street NW
- Stonehedge Drive NE Extension from 48th Street NE to CSAH 22 (East Circle Dr NE)
- 85th Street NW from CSAH 3 to CR 112 (18th Avenue NW)
- CSAH 14 (75th Street NW) from 60th Avenue NW to West TH 52 Frontage Rd
- CSAH 14 (75th Street NW) from East TH 52 Frontage Rd to CR 112 (18th Avenue NW)
- 65th Street NW from CSAH 3 to 50th Avenue NE
- 55th Street NW from CSAH 3 to CSAH 22 (West Circle Dr NW)
- 55th Street NW / 48th Street NE from CR 112 (18th Avenue NW) to CSAH 11 (55th Avenue NE)
- CSAH 4 (Valleyhigh Road) from CSAH 3 to 50th Avenue NW

Key Intersections

- 60th Avenue NW / 85th Street NW
- 60th Avenue NW / CSAH 14 (75th Street NW)
- 60th Avenue NW / 65th Street NW
- 60th Avenue NW / 55th Street NW
- 60th Avenue NW / CSAH 4 (Valleyhigh Road NW)
- CSAH 3 / 65th Street NW
- CSAH 3 / CSAH 4 (Valleyhigh Road NW)
- 50th Avenue NW (to be built) / 85th Street NW
- 50th Avenue NW (to be expanded) / CSAH 14 (75th Street NW)
- 50th Avenue NW / 65th Street NW
- 50th Avenue NW / 55th Street NW
- 50th Avenue NW / CSAH 4 (Valleyhigh Rd)
- TH 52 West Frontage Road (to be built) / CSAH 14 (75th Street NW)
- TH 52 East Frontage Road (to be built) / CSAH 14 (75th Street NW)
- CR 112 (18th Avenue NW) / 85th Street NW
- CR 112 (18th Avenue NW) / CSAH 14 (75th Street NW)
- CR 112 (18th Avenue NW) / Overland Drive (to be built)
- CR 133 (West River Road) / 55th Street NW / 48th Street NE (to be built)
- East River Road / 55th Street NE (to be built)

- TH 63 / 48th Street NE
- CR 124 (Hadley Valley Road) / 48th Street NE

Currently, most of the roadways in the project area are two-lane paved facilities. Traffic volumes range from 680 to 7,500 vehicles per day. All existing intersections are controlled with STOP signs. Existing urban land use is limited, most land use consisting of grasslands, agricultural land, and farmsteads.

Traffic volumes for Year 2035 were generated using ROCOG's Travel Demand Model. Land use changes in the project area at full build-out added an additional 700,000 vehicle trips to the roadway network. ADTs ranged from 11,100 to 52,100 vehicles per day. Left turn movements were as large as 1,310 vehicles during the PM peak hour.

An operational analysis was completed for roadway segments and intersections. Roadway operations were evaluated by comparing average daily traffic counts with level of service bar charts developed using methodologies from the Highway Capacity Manual. Intersections were evaluated using estimated PM peak hour critical movements. Assuming existing geometry, thirty-one (out of a total thirty-two) segments operated under congested conditions. Sixteen (out of a total twenty-one) intersections operated below the desired level of service.

Forecasted average daily traffic volumes were used to estimate roadway cross-sections that will meet ROCOG's level of service guidelines. It should be noted that this analysis should be used for right-of-way purposes only. More detailed study should be completed in the form of a corridor study at the time of development. Corridor studies are needed to determine the final cross-sections and alignments of future roadway improvements. The following cross-sections are recommended for future consideration:

Six-Lane with Right and Left Turn Lanes

- CR 112 (18th Avenue NW) from Overland Drive to 55th Street NW
- CSAH 14 (75th Street NW) from 50th Avenue NW to West TH 52 Frontage Road
- CSAH 14 (75th Street NW) from East TH 52 Frontage Road to CR 112 (18th Avenue NW)
- 65th Street NW from 60th Avenue NW to 50th Avenue NW
- 55th Street NW from 60th Avenue NW to CSAH 22 (West Circle Drive)
- 55th Street NW from CR 112 (18th Avenue NW) to CR 133 (West River Road)

Four-Lane with Right and Left Turn Lanes

- CSAH 3 from 65th Street NW to 55th Street NW
- 60th Avenue NW from CSAH 14 (75th Street NW) to CSAH 4 (Valleyhigh Road)
- 50th Avenue NW from 85th Street NW to CSAH 4 (Valleyhigh Road)
- CR 112 (18th Avenue NW) from 85th Street NW to Overland Drive
- 85th Street NW from 60th Avenue NW to CR 112 (18th Avenue NW)
- CSAH 14 (75th Street NW) from 60th Avenue NW to 50th Avenue NW
- 55th Street NW from CSAH 3 to 60th Avenue NW
- 55th Street / 48th Street NE from CR 133 (West River Road) to TH 63
- 48th Street NE from TH 63 to CSAH 11 (55th Avenue NE)
- CSAH 4 (Valleyhigh Road) from CSAH 3 to 50th Avenue NW

Three-Lane with Right and Left Turn Lanes

- CSAH 3 from 55th Street NW to CSAH 4 (Valleyhigh Road)
- 60th Avenue NW from 85th Street NW to CSAH 14 (75th Street NW)
- Stonehedge Drive NE Extension from 48th Street NE to CSAH 22 (East Circle Drive)
- 65th Street NW from CSAH 3 to 60th Avenue NW

Intersection analysis included determining where turn lanes and traffic signals would likely be needed. With the high PM peak hour turning movements, all intersections will require separate turn lanes. Additionally, all intersections except 60th Avenue NW / 85th Street NW are expected to meet the PM peak hour traffic signal warrant analysis, which indicate the possible need for a traffic signal.

Appendix A
Distribution of Future Project Land Uses By Traffic Analysis Zone

TAZ	Land Use	Quantity	Units
99	Suburban Multi Family Residential	348	Dwelling Units
99	Urban Multi Family Residential	108	Dwelling Units
108	General Commercial	382	1,000 SqFt
108	Hi-Int Retail	29	1,000 SqFt
108	Office	65	1,000 SqFt
108	Suburban Single Family Residential	1	Dwelling Units
111	Suburban Single Family Residential	8	Dwelling Units
112	Suburban Single Family Residential	86	Dwelling Units
113	Suburban Single Family Residential	114	Dwelling Units
115	Hi-Int Retail	2	1,000 SqFt
115	Industrial	148	1,000 SqFt
131	Office	250	1,000 SqFt
138	Dev Park	50	Acres
138	Office	100	1,000 SqFt
138	Suburban Single Family Residential	2	Dwelling Units
169	Suburban Single Family Residential	432	Dwelling Units
169	Urban Multi Family Residential	120	Dwelling Units
180	Office	50	1,000 SqFt
180	Urban Multi Family Residential	54	Dwelling Units
182	General Commercial	83	1,000 SqFt
182	Hi-Int Retail	6	1,000 SqFt
182	Office	256	1,000 SqFt
182	Suburban Multi Family Residential	50	Dwelling Units
182	Suburban Single Family Residential	61	Dwelling Units
182	Urban Multi Family Residential	82	Dwelling Units
183	Suburban Single Family Residential	11	Dwelling Units
184	Hi-Int Retail	2	1,000 SqFt
193	Hotels	90	Rooms
193	Office	22	1,000 SqFt
211	Hi-Int Retail	2	1,000 SqFt
211	Industrial	345	1,000 SqFt
211	Office	58	1,000 SqFt
212	Suburban Single Family Residential	167	Dwelling Units
214	Office	89	1,000 SqFt
214	Suburban Multi Family Residential	120	Dwelling Units
214	Suburban Single Family Residential	240	Dwelling Units
215	Group Home	175	Rooms
215	Social Services	22	1,000 SqFt
215	Suburban Multi Family Residential	10	Dwelling Units
215	Suburban Single Family Residential	1,563	Dwelling Units
216	Dev Park	100	Acres
216	Suburban Single Family Residential	2,117	Dwelling Units
219	Industrial	300	1,000 SqFt
220	Hotels	70	Rooms
220	Office	75	1,000 SqFt
222	Group Home	26	Rooms
223	Suburban Single Family Residential	81	Dwelling Units
224	Office	15	1,000 SqFt

TAZ	Land Use	Quantity	Units
226	Suburban Single Family Residential	320	Dwelling Units
227	Suburban Multi Family Residential	24	Dwelling Units
227	Urban Multi Family Residential	150	Dwelling Units
240	General Commercial	47	1,000 SqFt
240	Hi-Int Retail	2	1,000 SqFt
240	Industrial	40	1,000 SqFt
240	Office	11	1,000 SqFt
240	Suburban Multi Family Residential	78	Dwelling Units
240	Suburban Single Family Residential	25	Dwelling Units
240	Urban Multi Family Residential	4	Dwelling Units
241	Suburban Multi Family Residential	72	Dwelling Units
241	Suburban Single Family Residential	137	Dwelling Units
241	Urban Multi Family Residential	140	Dwelling Units
242	Group Home	374	Rooms
242	Hi-Int Retail	2	1,000 SqFt
242	Office	20	1,000 SqFt
242	Suburban Multi Family Residential	178	Dwelling Units
242	Suburban Single Family Residential	80	Dwelling Units
242	Urban Multi Family Residential	140	Dwelling Units
243	Office	25	1,000 SqFt
245	Suburban Single Family Residential	236	Dwelling Units
246	Mayo	5,000	1,000 SqFt
246	Office	698	1,000 SqFt
247	Office	20	1,000 SqFt
247	Suburban Multi Family Residential	62	Dwelling Units
247	Urban Multi Family Residential	79	Dwelling Units
249	Hi-Int Retail	4	1,000 SqFt
249	Industrial	110	1,000 SqFt
249	Office	164	1,000 SqFt
267	Suburban Multi Family Residential	250	Dwelling Units
267	Suburban Single Family Residential	233	Dwelling Units
268	Suburban Multi Family Residential	290	Dwelling Units
268	Suburban Single Family Residential	262	Dwelling Units
269	Suburban Single Family Residential	192	Dwelling Units
272	Suburban Multi Family Residential	290	Dwelling Units
272	Suburban Single Family Residential	140	Dwelling Units
273	Office	50	1,000 SqFt
273	Suburban Multi Family Residential	70	Dwelling Units
273	Suburban Single Family Residential	382	Dwelling Units
274	Suburban Single Family Residential	365	Dwelling Units
274	Urban Multi Family Residential	324	Dwelling Units
275	General Commercial	40	1,000 SqFt
275	Office	50	1,000 SqFt
275	Social Services	20	1,000 SqFt
275	Suburban Multi Family Residential	32	Dwelling Units
275	Suburban Single Family Residential	156	Dwelling Units
276	Dev Park	5	Acres
276	Hotels	300	Rooms
276	Industrial	453	1,000 SqFt

TAZ	Land Use	Quantity	Units
276	Urban Multi Family Residential	100	Dwelling Units
277	Dev Park	9	Acres
277	Elementary School	484	Students
277	Office	45	1,000 SqFt
277	Social Services	30	1,000 SqFt
277	Suburban Multi Family Residential	320	Dwelling Units
277	Suburban Single Family Residential	400	Dwelling Units
277	Urban Multi Family Residential	100	Dwelling Units
278	Dev Park	20	Acres
278	Suburban Multi Family Residential	389	Dwelling Units
278	Suburban Single Family Residential	598	Dwelling Units
279	General Commercial	129	1,000 SqFt
279	Office	200	1,000 SqFt
280	Dev Park	40	Acres
280	Elementary School	350	Students
280	Hi-Int Retail	2	1,000 SqFt
280	Suburban Multi Family Residential	209	Dwelling Units
280	Suburban Single Family Residential	667	Dwelling Units
281	Dev Park	20	Acres
281	Elementary School	324	Students
281	Suburban Multi Family Residential	160	Dwelling Units
281	Suburban Single Family Residential	160	Dwelling Units
282	Hi-Int Retail	13	1,000 SqFt
282	Suburban Multi Family Residential	209	Dwelling Units
282	Suburban Single Family Residential	643	Dwelling Units
282	Urban Multi Family Residential	270	Dwelling Units
283	Dev Park	40	Acres
283	Group Home	175	Rooms
283	Social Services	17	1,000 SqFt
283	Suburban Multi Family Residential	244	Dwelling Units
283	Suburban Single Family Residential	763	Dwelling Units
283a	Suburban Single Family Residential	273	Dwelling Units
283b	Suburban Single Family Residential	1,101	Dwelling Units
285	Suburban Multi Family Residential	170	Dwelling Units
285	Suburban Single Family Residential	991	Dwelling Units
286	Dev Park	116	Acres
286	Industrial	57	1,000 SqFt
286	Office	427	1,000 SqFt
286	ShopCenter	100	1,000 SqFt
286	Suburban Single Family Residential	309	Dwelling Units
289	Dev Park	20	Acres
289	Elementary School	350	Students
289	Industrial	174	1,000 SqFt
289	Suburban Multi Family Residential	418	Dwelling Units
289	Suburban Single Family Residential	1,798	Dwelling Units
290	Dev Park	40	Acres
290	Elementary School	350	Students
290	General Commercial	294	1,000 SqFt
290	Hi-Int Retail	20	1,000 SqFt

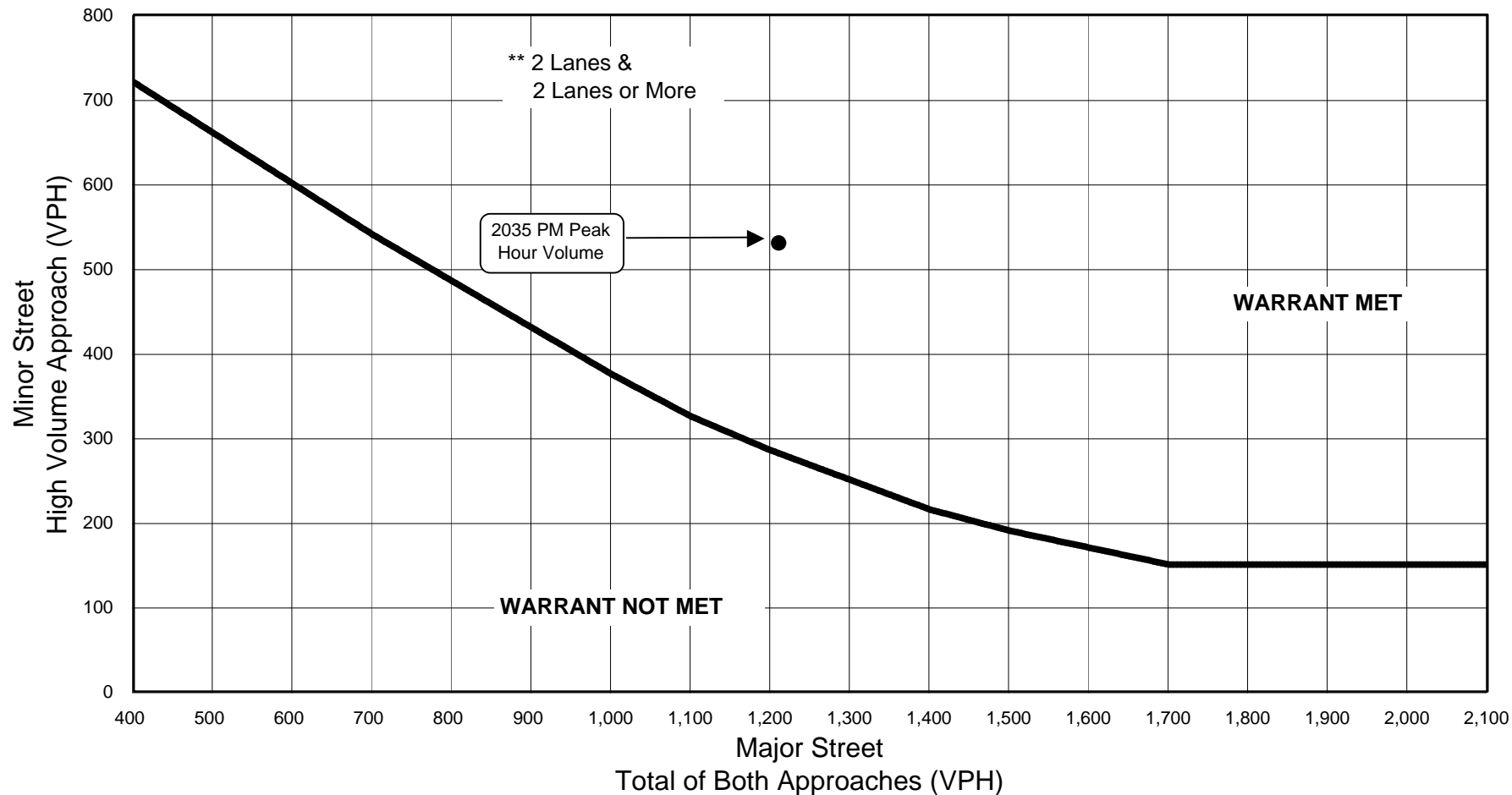
TAZ	Land Use	Quantity	Units
290	Office	65	1,000 SqFt
290	ShopCenter	87	1,000 SqFt
290	Social Services	13	1,000 SqFt
290	Suburban Multi Family Residential	209	Dwelling Units
290	Suburban Single Family Residential	458	Dwelling Units
290	Urban Multi Family Residential	270	Dwelling Units
290a	Suburban Single Family Residential	278	Dwelling Units
295	Dev Park	80	Acres
295	Office	65	1,000 SqFt
295	Social Services	13	1,000 SqFt
295	Suburban Multi Family Residential	226	Dwelling Units
295	Suburban Single Family Residential	894	Dwelling Units
295	Urban Multi Family Residential	270	Dwelling Units
296	Elementary School	350	Students
296	Office	174	1,000 SqFt
296	Secondary School	2,000	Students
296	Social Services	39	1,000 SqFt
296	Suburban Multi Family Residential	279	Dwelling Units
296	Suburban Single Family Residential	152	Dwelling Units
296	Urban Multi Family Residential	405	Dwelling Units
297	Group Home	140	Rooms
297	Office	87	1,000 SqFt
297	Social Services	22	1,000 SqFt
297	Suburban Multi Family Residential	209	Dwelling Units
297	Suburban Single Family Residential	763	Dwelling Units
297	Urban Multi Family Residential	270	Dwelling Units
297a	Suburban Single Family Residential	60	Dwelling Units
298	General Commercial	30	1,000 SqFt
298	Group Home	139	Rooms
298	Office	40	1,000 SqFt
298	Social Services	10	1,000 SqFt
298	Suburban Multi Family Residential	500	Dwelling Units
298	Suburban Single Family Residential	425	Dwelling Units
298	Urban Multi Family Residential	424	Dwelling Units
329	Suburban Single Family Residential	224	Dwelling Units
330	Suburban Single Family Residential	8	Dwelling Units
331	General Commercial	146	1,000 SqFt
331	Office	459	1,000 SqFt
331	Social Services	61	1,000 SqFt
331	Suburban Multi Family Residential	30	Dwelling Units
331	Suburban Single Family Residential	92	Dwelling Units
331	Urban Multi Family Residential	250	Dwelling Units
332	Suburban Single Family Residential	455	Dwelling Units
333	BigBox	255	1,000 SqFt
333	Elementary School	350	Students
333	General Commercial	318	1,000 SqFt
333	Hi-Int Retail	17	1,000 SqFt
333	Hotels	120	Rooms
333	Office	87	1,000 SqFt

TAZ	Land Use	Quantity	Units
333	ShopCenter	594	1,000 SqFt
333	Social Services	39	1,000 SqFt
334	Hi-Int Retail	2	1,000 SqFt
334	Hotels	120	Rooms
334	Industrial	800	1,000 SqFt
334	ShopCenter	100	1,000 SqFt
335	Dev Park	20	Acres
335	Elementary School	350	Students
335	Suburban Multi Family Residential	278	Dwelling Units
335	Suburban Single Family Residential	398	Dwelling Units
335	Urban Multi Family Residential	605	Dwelling Units
336	Dev Park	40	Acres
336	Group Home	175	Rooms
336	Secondary School	3,300	Students
336	Suburban Multi Family Residential	313	Dwelling Units
336	Suburban Single Family Residential	218	Dwelling Units
336	Urban Multi Family Residential	324	Dwelling Units
337	BigBox	200	1,000 SqFt
337	Hi-Int Retail	4	1,000 SqFt
337	Hotels	200	Rooms
337	Industrial	749	1,000 SqFt
337	ShopCenter	200	1,000 SqFt
338	Elementary School	350	Students
338	Office	174	1,000 SqFt
338	Social Services	39	1,000 SqFt
338	Suburban Multi Family Residential	418	Dwelling Units
338	Suburban Single Family Residential	1,090	Dwelling Units
338	Urban Multi Family Residential	486	Dwelling Units
339	Dev Park	200	Acres
339	Elementary School	350	Students
339	Suburban Multi Family Residential	222	Dwelling Units
339a	Suburban Single Family Residential	1,120	Dwelling Units
340	Dev Park	40	Acres
340	Elementary School	350	Students
340	Suburban Multi Family Residential	242	Dwelling Units
340	Suburban Single Family Residential	763	Dwelling Units
340	Urban Multi Family Residential	324	Dwelling Units
341	Suburban Multi Family Residential	174	Dwelling Units
341	Suburban Single Family Residential	790	Dwelling Units
341a	Suburban Single Family Residential	136	Dwelling Units
342	BigBox	113	1,000 SqFt
342	General Commercial	381	1,000 SqFt
342	Hi-Int Retail	15	1,000 SqFt
342	Hotels	99	Rooms
342	Industrial	300	1,000 SqFt
342	Office	324	1,000 SqFt
342	ShopCenter	218	1,000 SqFt
342	Social Services	39	1,000 SqFt
342	Suburban Multi Family Residential	65	Dwelling Units

TAZ	Land Use	Quantity	Units
342	Urban Multi Family Residential	586	Dwelling Units
343	Dev Park	40	Acres
343	Elementary School	350	Students
343	Group Home	140	Rooms
343	Office	87	1,000 SqFt
343	Social Services	22	1,000 SqFt
343	Suburban Multi Family Residential	330	Dwelling Units
343	Suburban Single Family Residential	572	Dwelling Units
343	Urban Multi Family Residential	486	Dwelling Units
344	Dev Park	40	Acres
344	Suburban Multi Family Residential	65	Dwelling Units
344	Suburban Single Family Residential	818	Dwelling Units
344a	Suburban Single Family Residential	976	Dwelling Units
359	Industrial	436	1,000 SqFt
359	Suburban Multi Family Residential	209	Dwelling Units
359	Suburban Single Family Residential	174	Dwelling Units
359a	Suburban Single Family Residential	1,461	Dwelling Units
360	Dev Park	40	Acres
360	Elementary School	350	Students
360	Group Home	175	Rooms
360	Industrial	871	1,000 SqFt
360	Social Services	17	1,000 SqFt
360	Suburban Multi Family Residential	244	Dwelling Units
360	Suburban Single Family Residential	965	Dwelling Units
360	Urban Multi Family Residential	162	Dwelling Units
360a	Suburban Single Family Residential	1,793	Dwelling Units
361	Dev Park	40	Acres
361	Elementary School	350	Students
361	Industrial	174	1,000 SqFt
361	Office	87	1,000 SqFt
361	Social Services	26	1,000 SqFt
361	Suburban Multi Family Residential	209	Dwelling Units
361	Suburban Single Family Residential	1,782	Dwelling Units
361z	Industrial	174	1,000 SqFt
361z	Suburban Single Family Residential	1,684	Dwelling Units

Appendix B

Traffic Signal Warrant Analysis



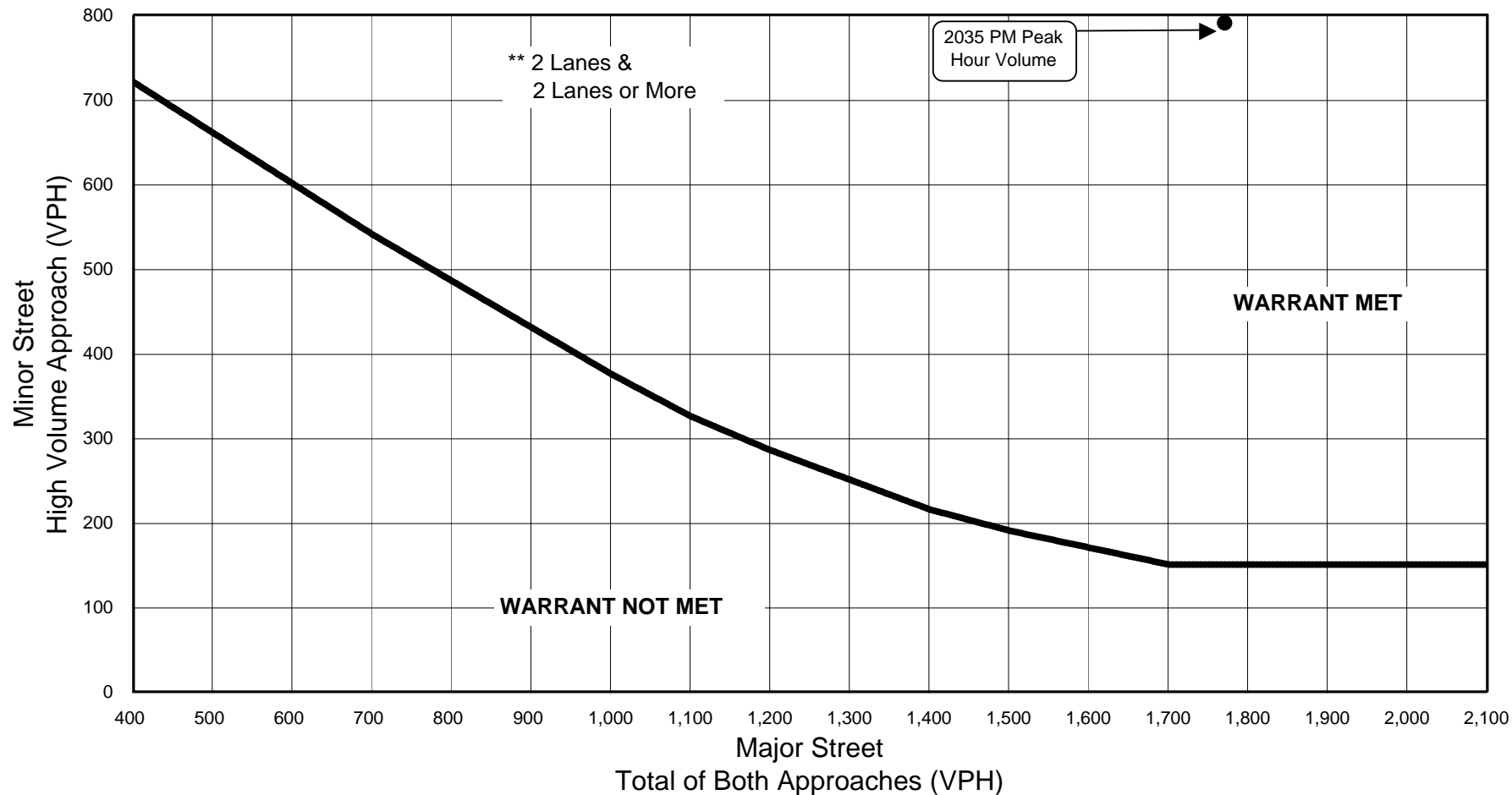
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**60th Avenue NW / CSAH 14
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



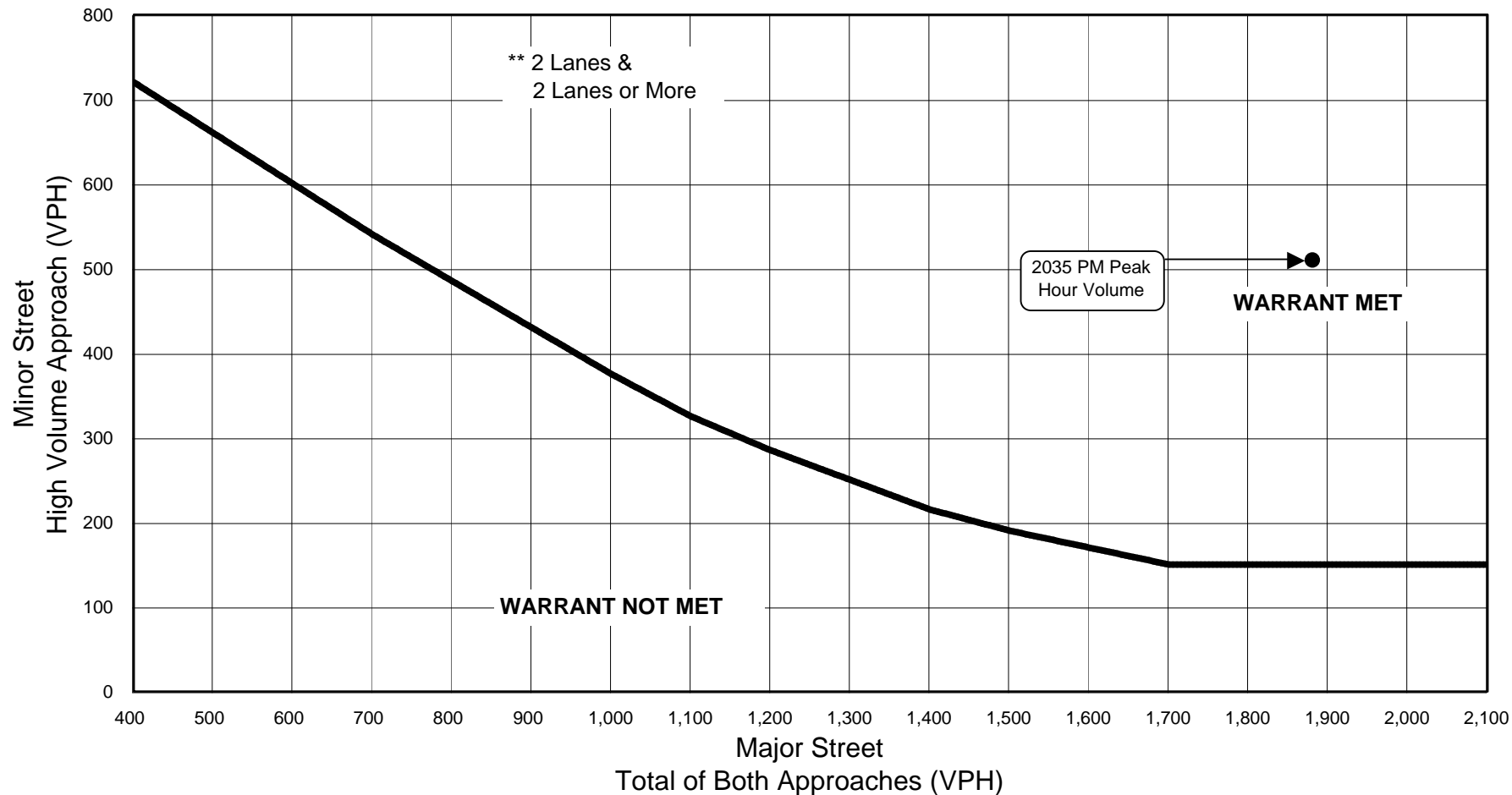
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**60th Avenue NW / 65th Street NW
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



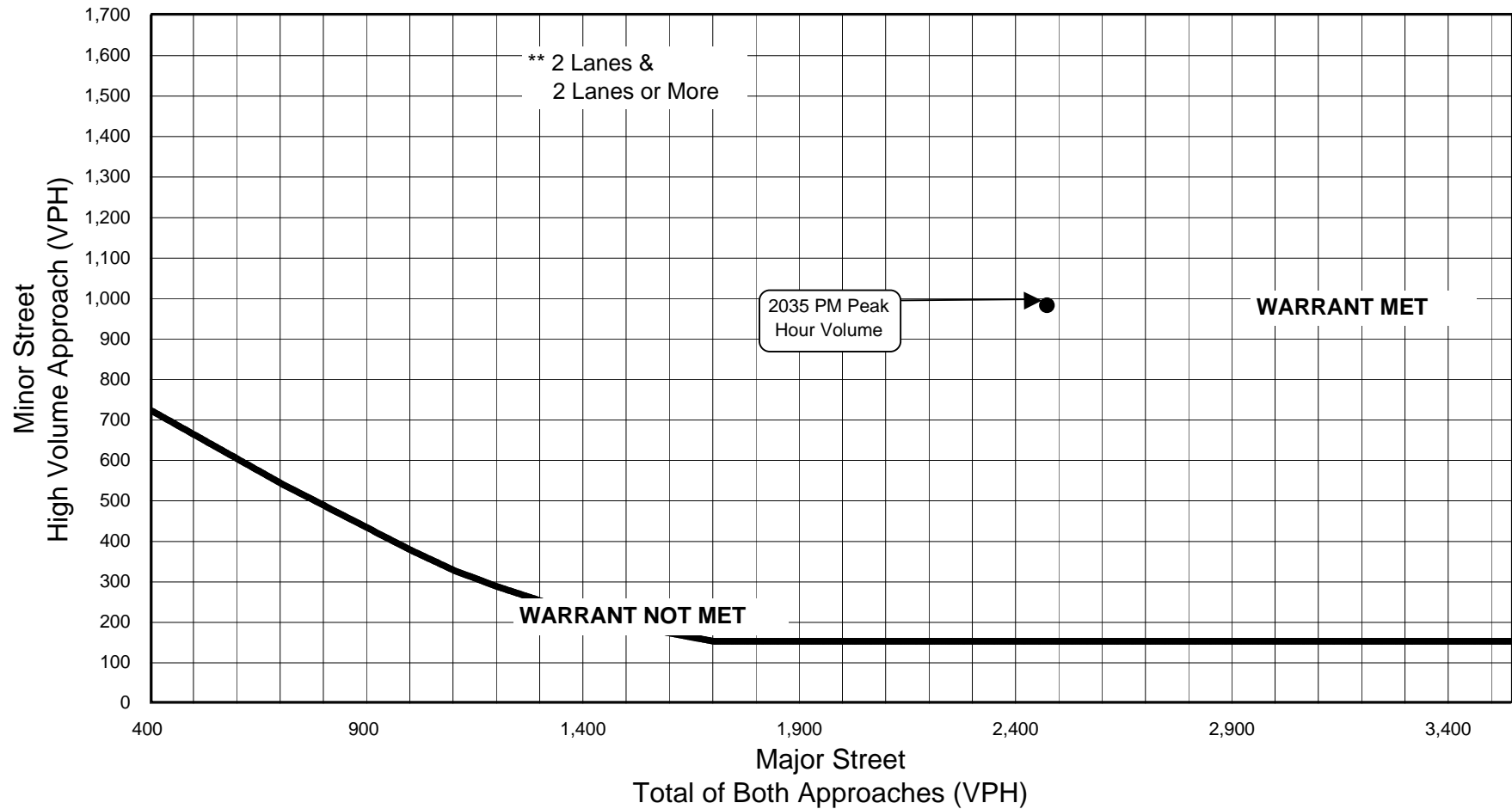
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

CSAH 3 / CSAH 4 Signal Warrant Analysis

Warrant 11 - Peak Hour Volume Warrant



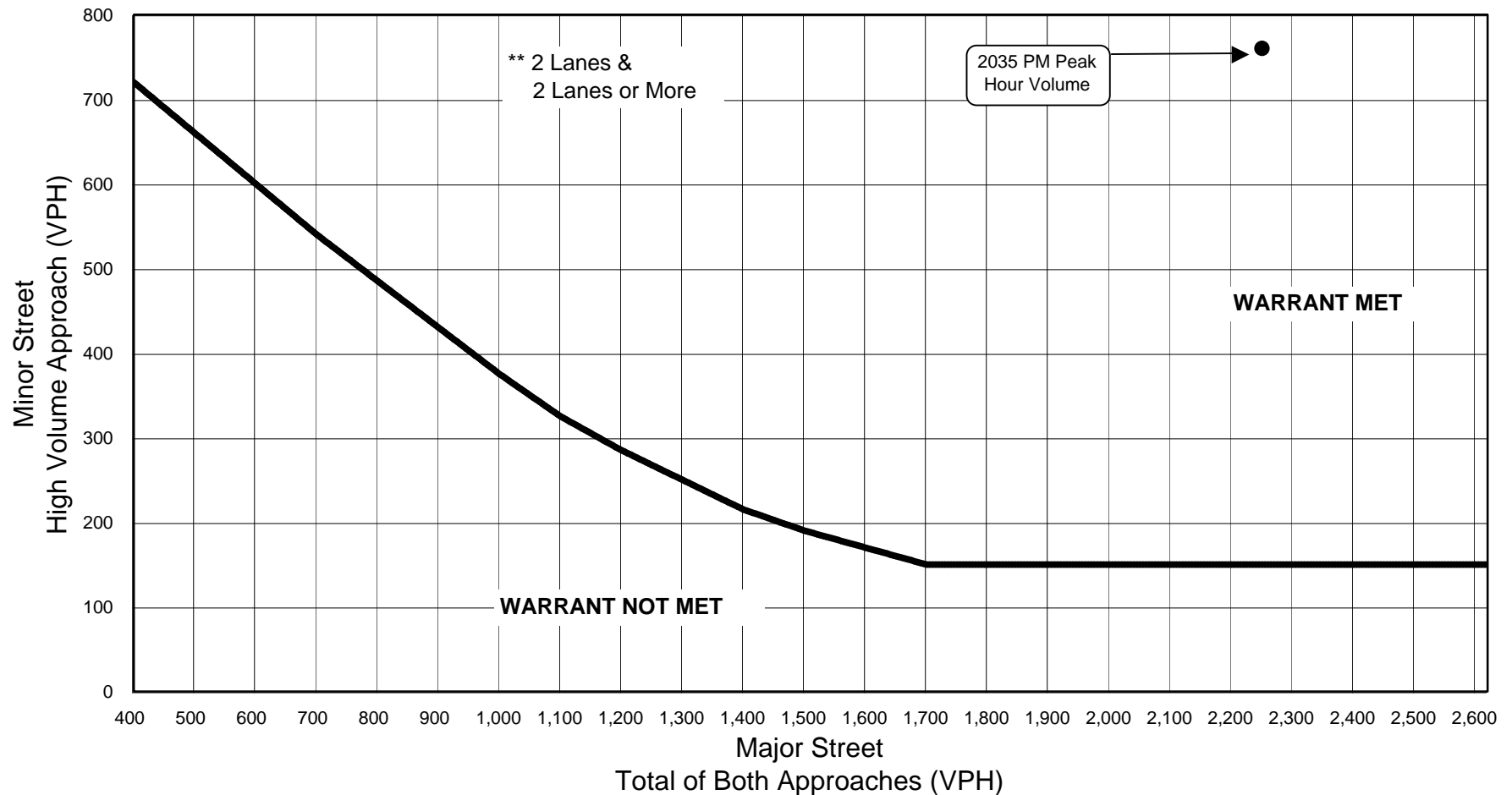
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**50th Avenue NW / 55th Street NW
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



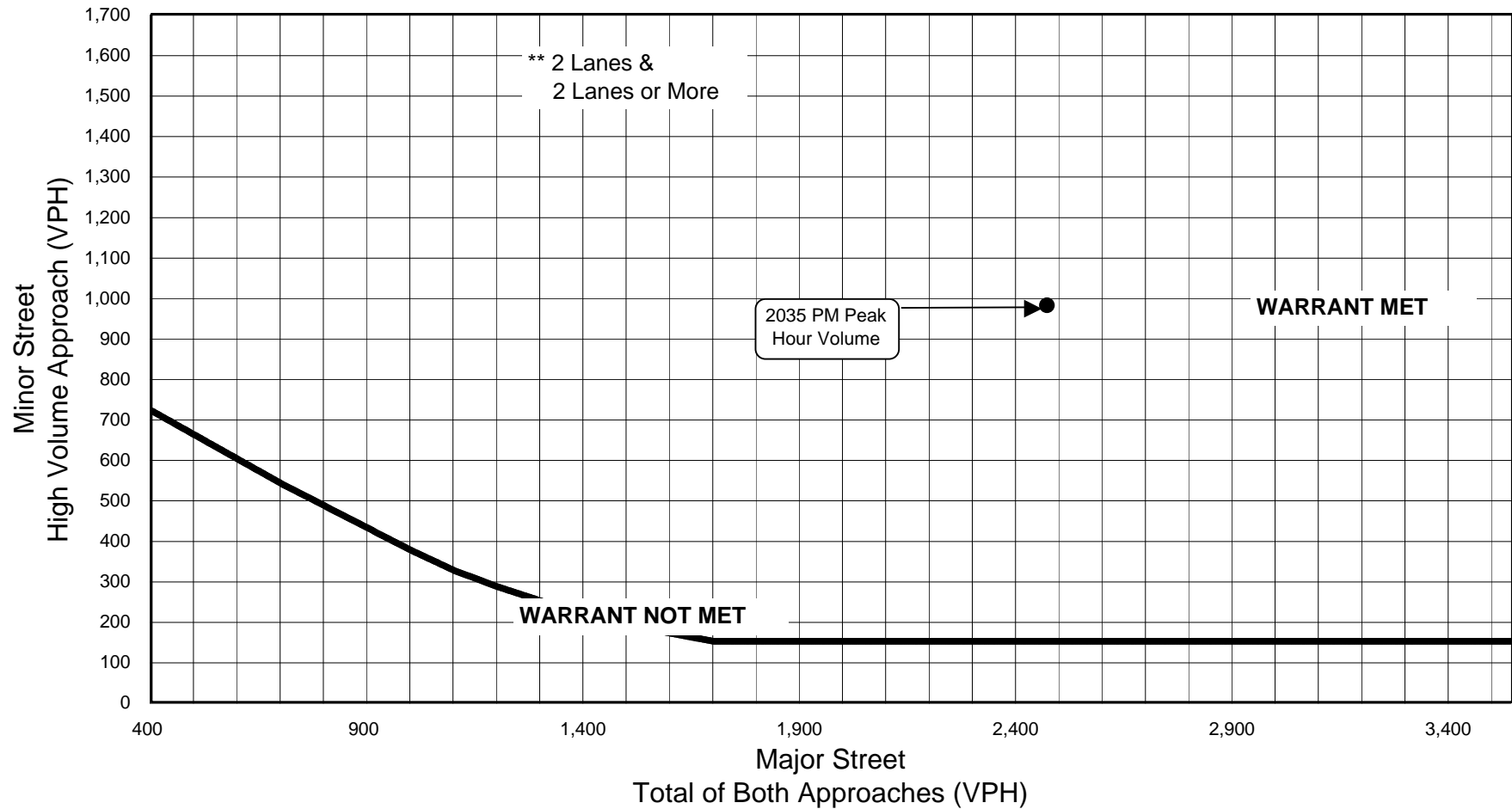
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**60th Avenue NW / 55th Street NW
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



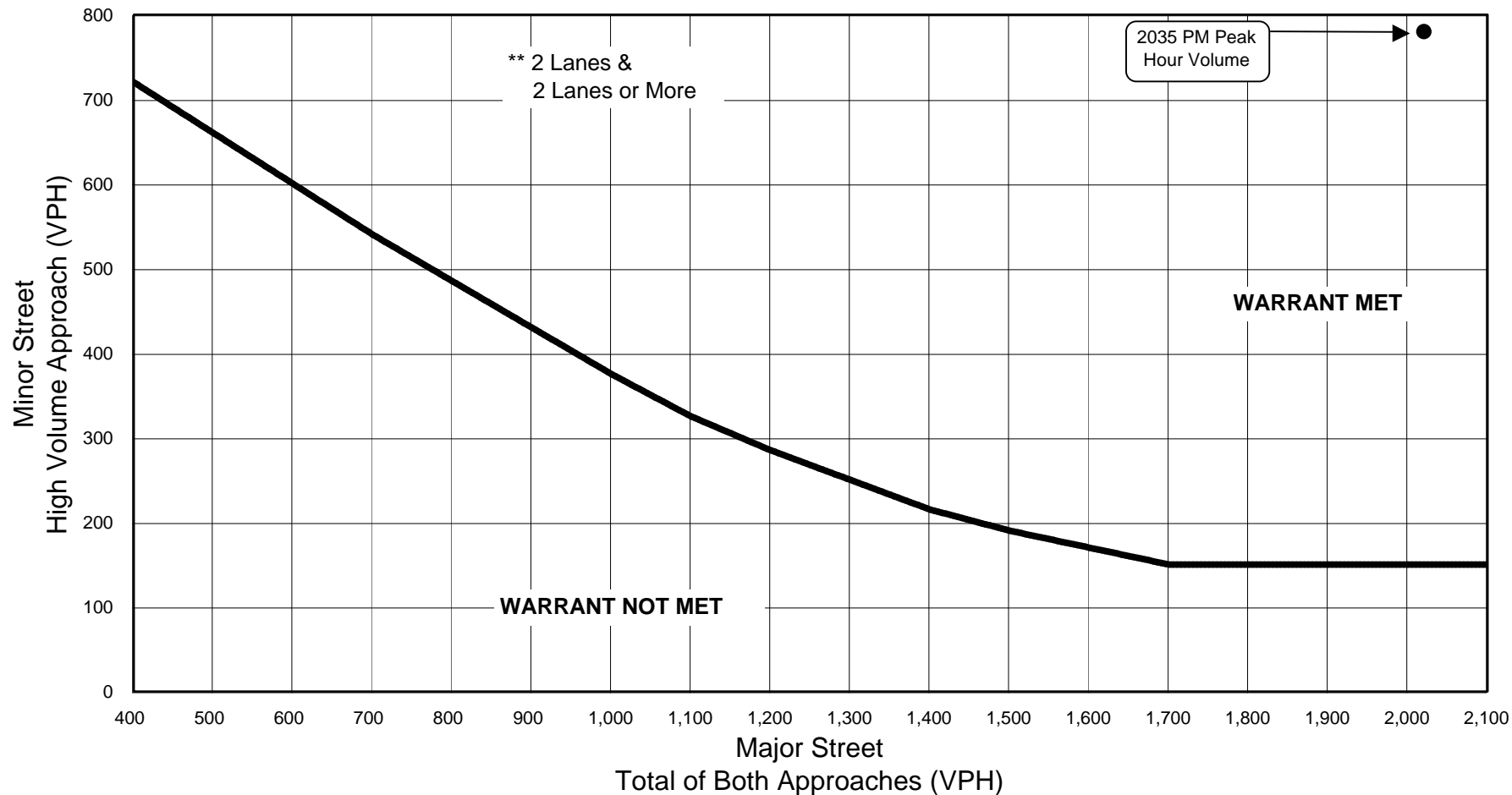
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**50th Avenue NW / 65th Street NW
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



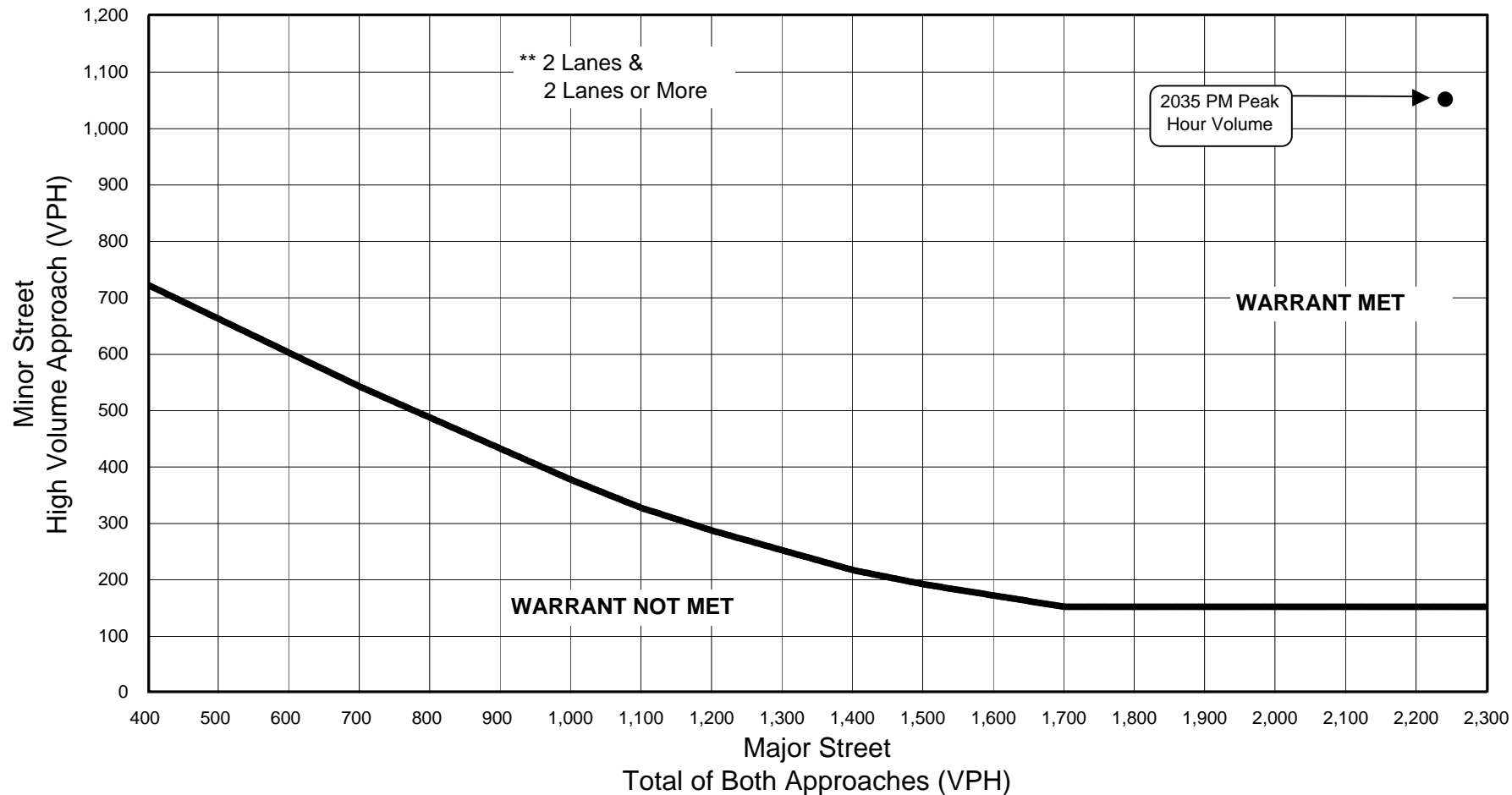
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**50th Avenue NW / CSAH 14
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



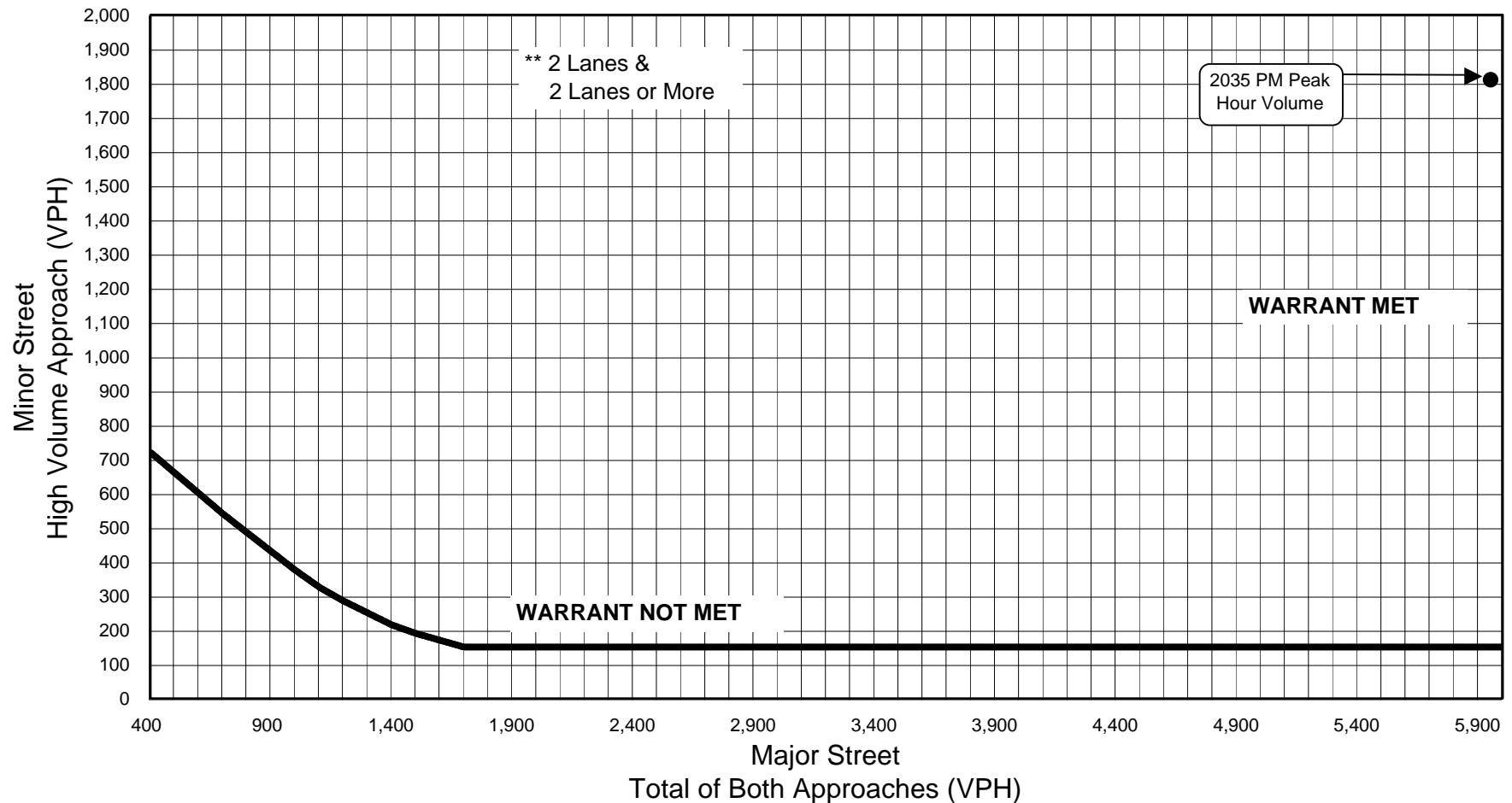
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**50th Avenue NW / CSAH 4
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



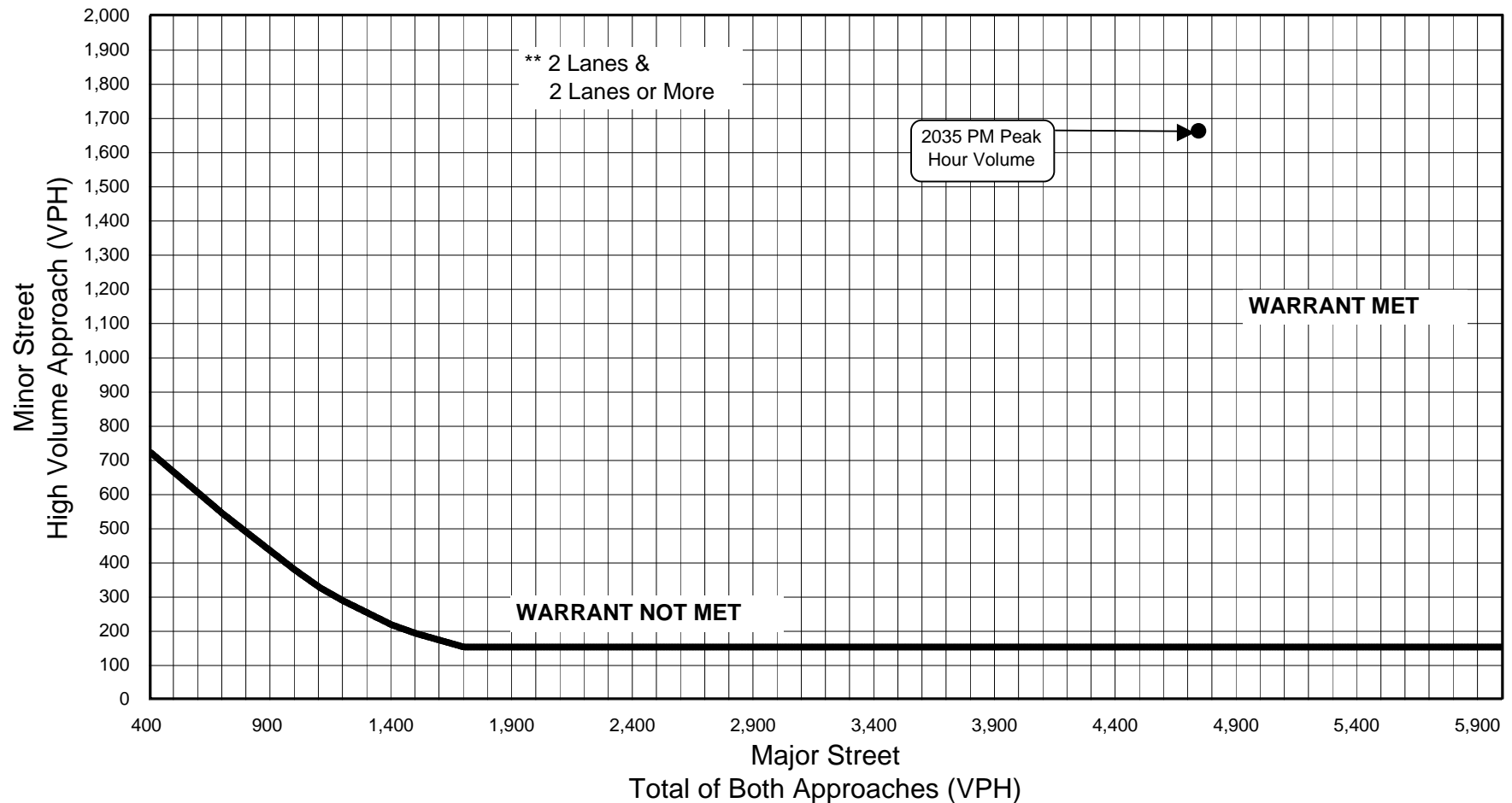
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**TH 52 East Frontage Road / CSAH 14
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



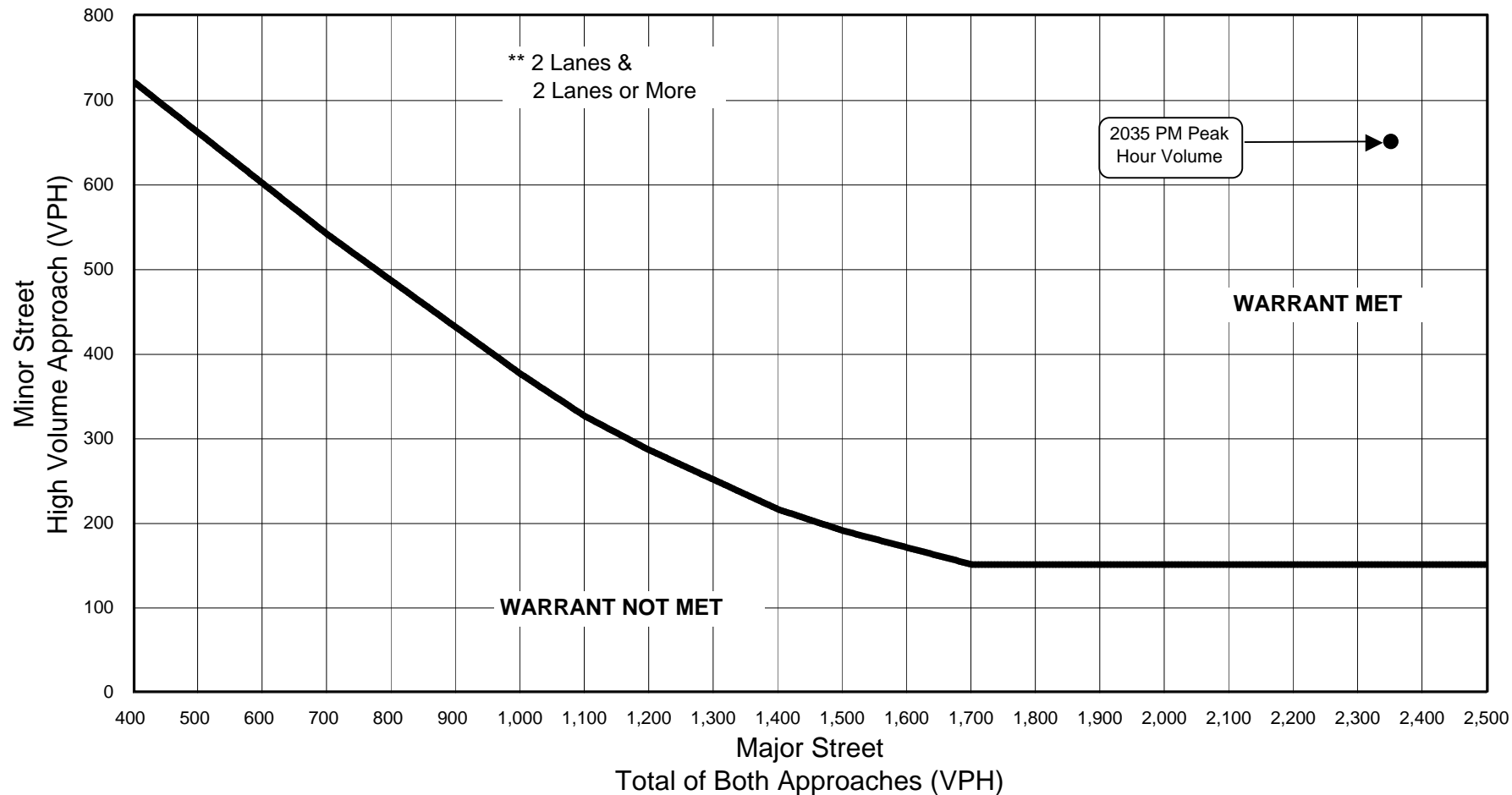
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**TH 52 West Frontage Road / CSAH 14
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



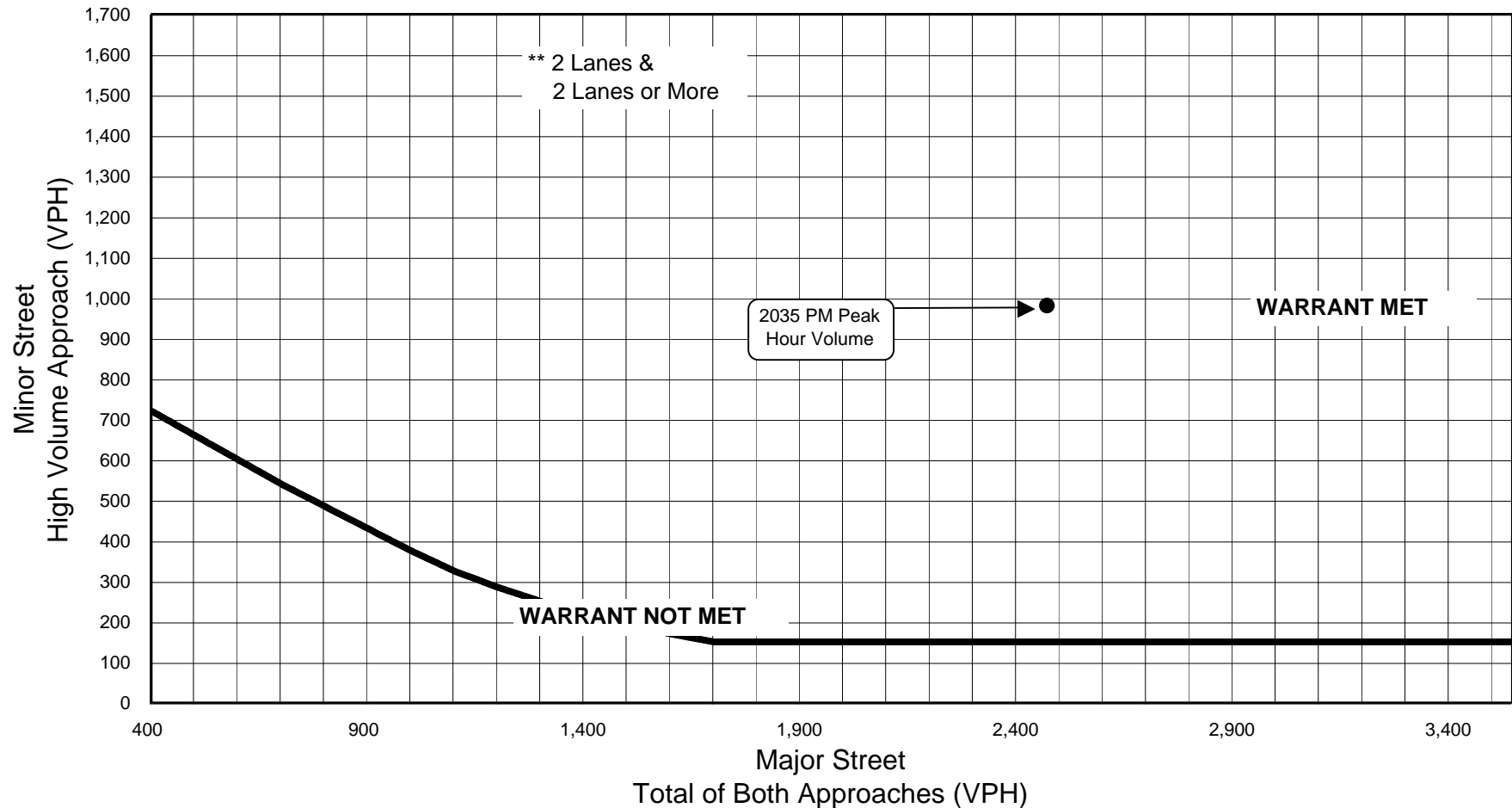
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**East River Road / 55th Street / 48th Street
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



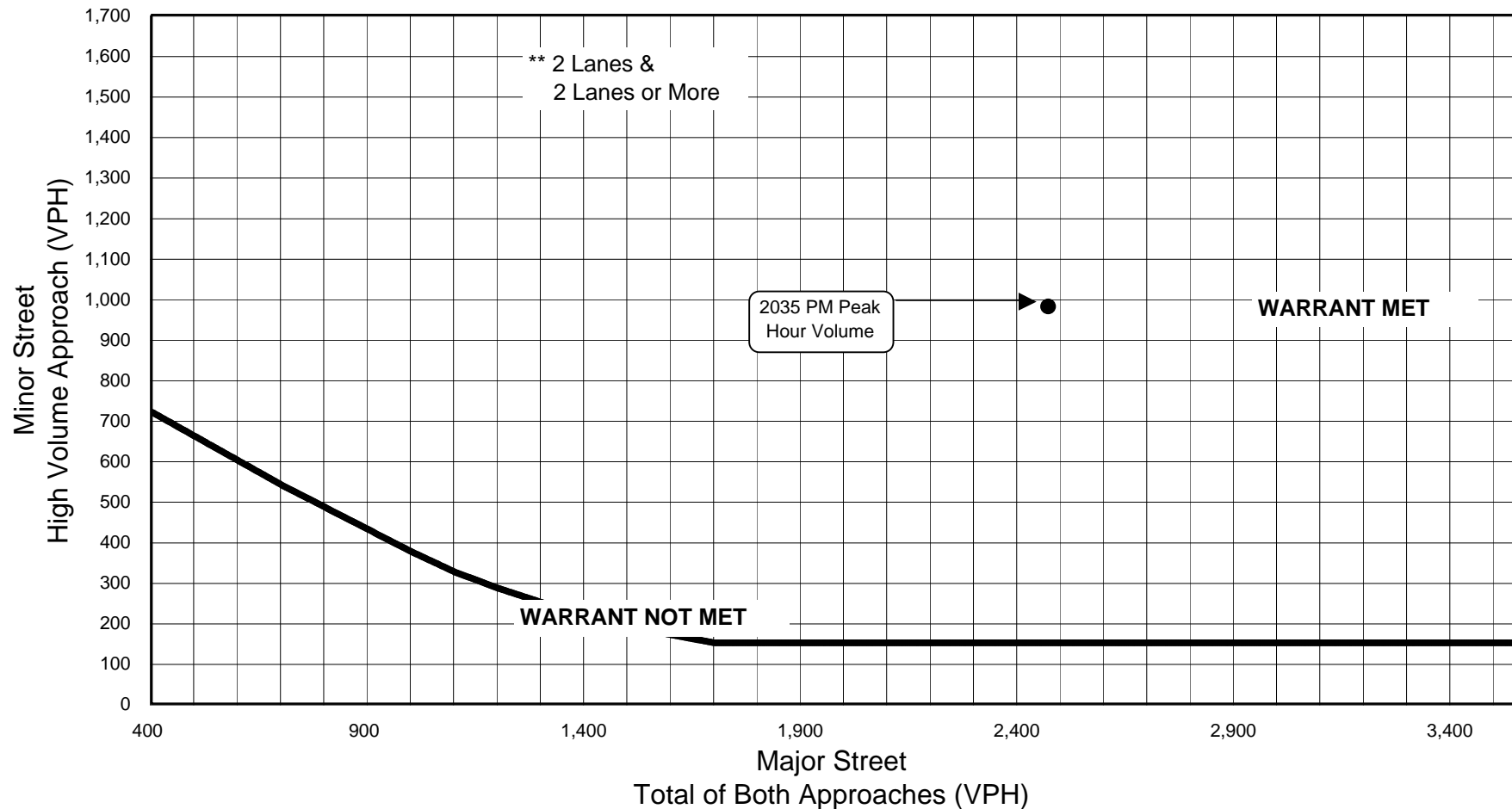
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**CR 112 (18th Ave NW) / CSAH 14 (75th St NW)
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



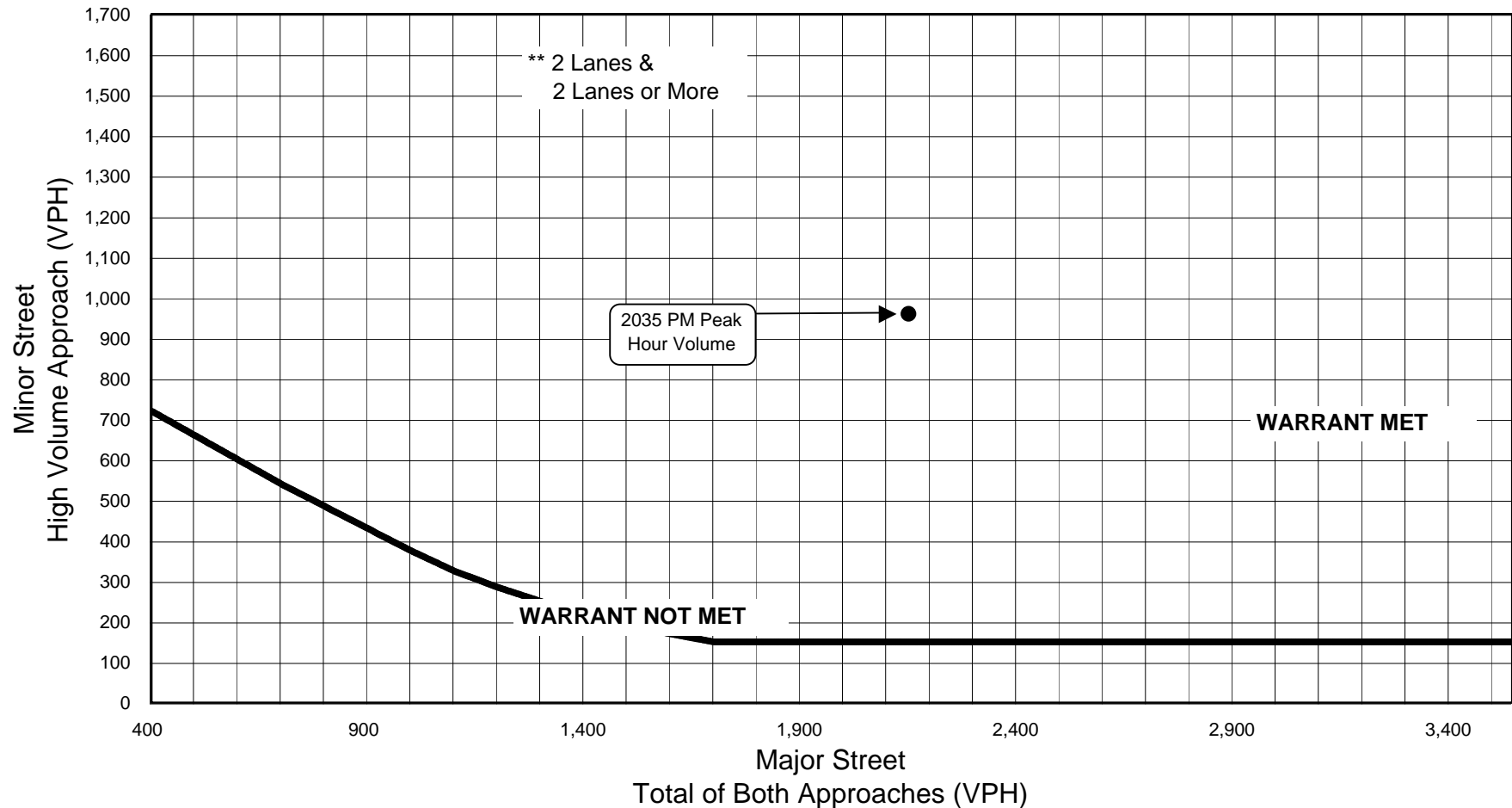
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**CR 112 (18th Ave NW) / Overland Drive
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



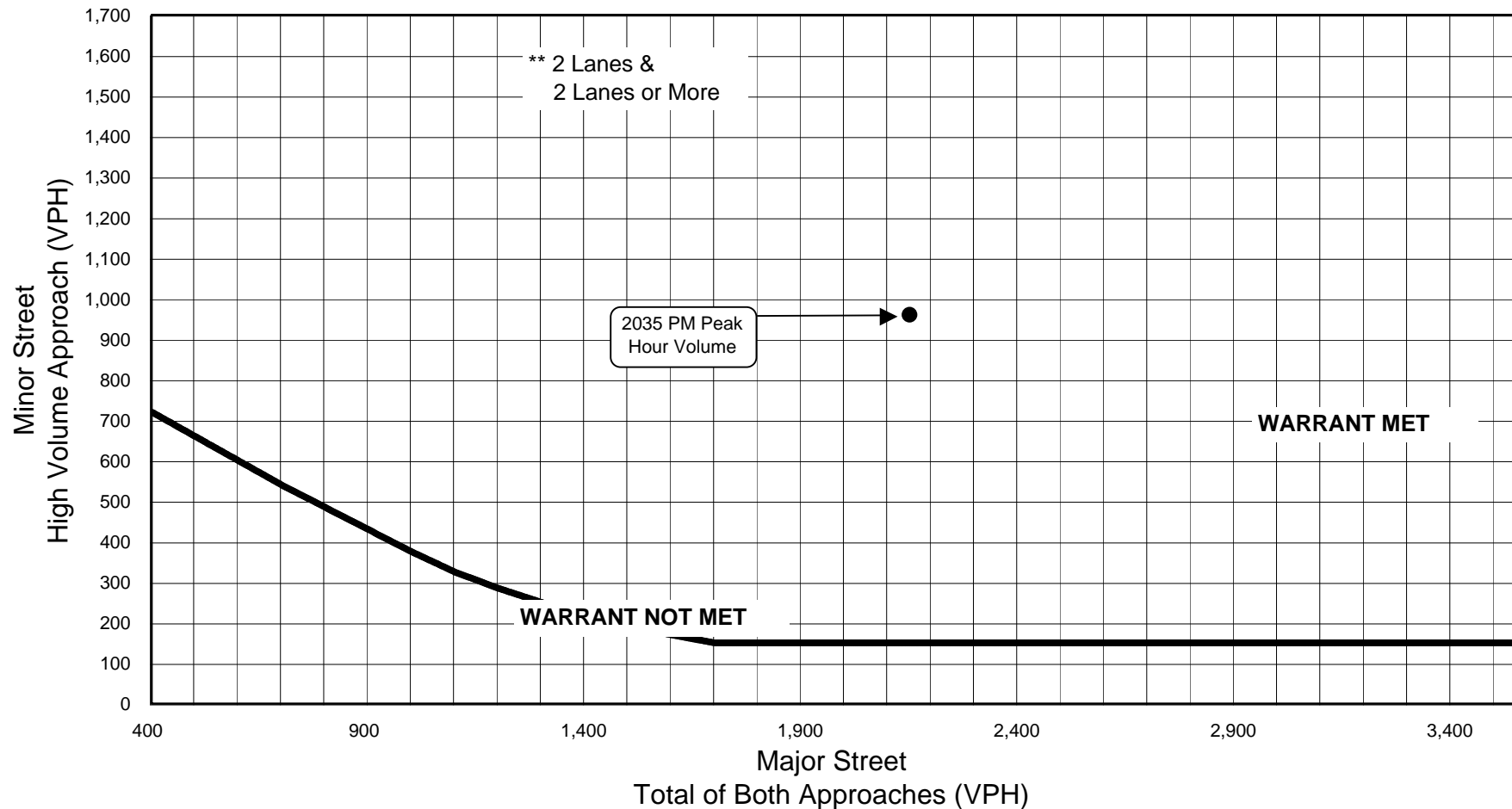
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**CR 133 (West River Road) / 55th St NW / 48th St NW
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



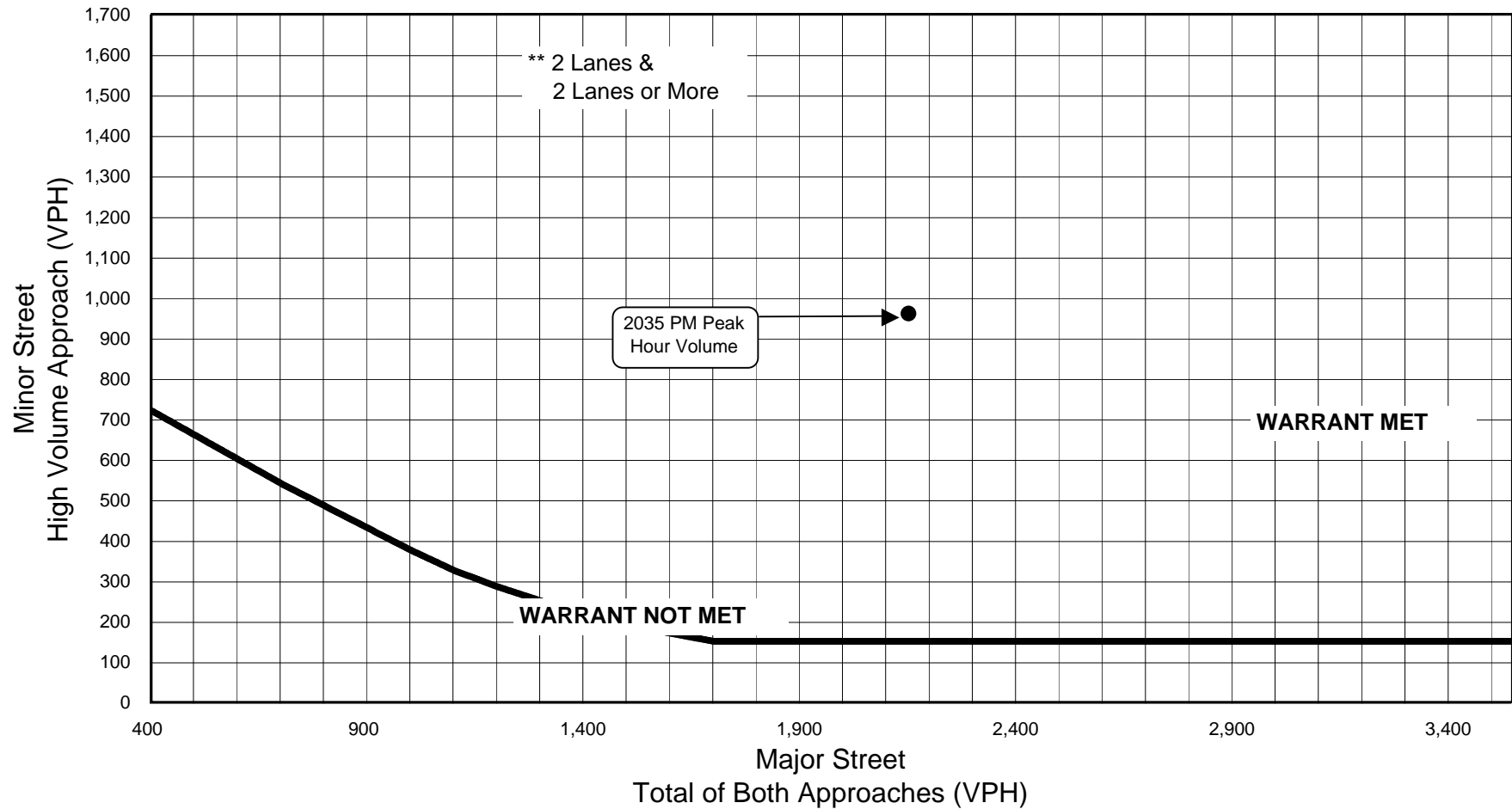
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**TH 63 / CR 124 (48th Street)
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



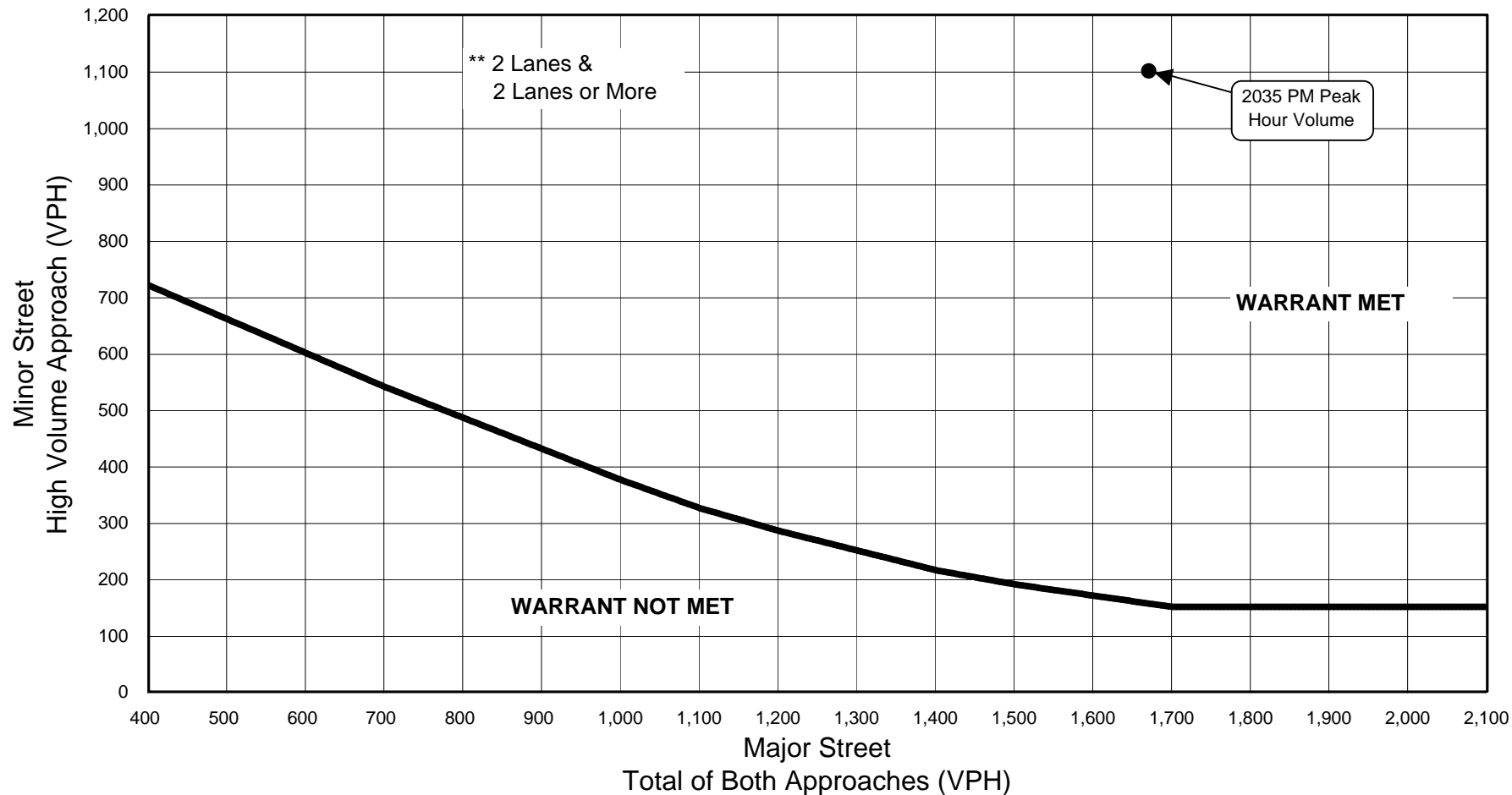
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**CR 124 (Hadley Valley Rd) / 48th Street NE
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



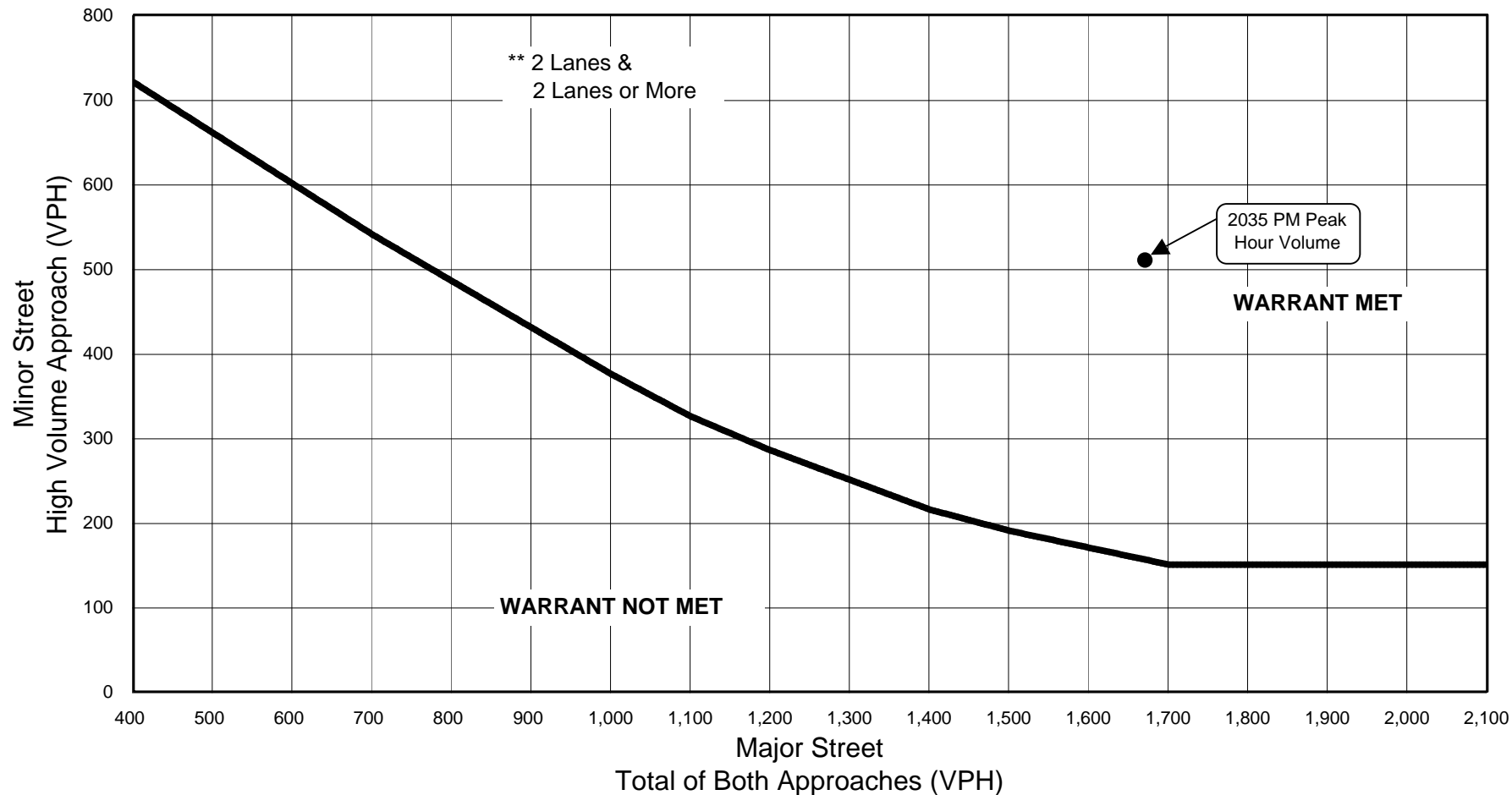
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**CR 112 / 85th Street NW
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



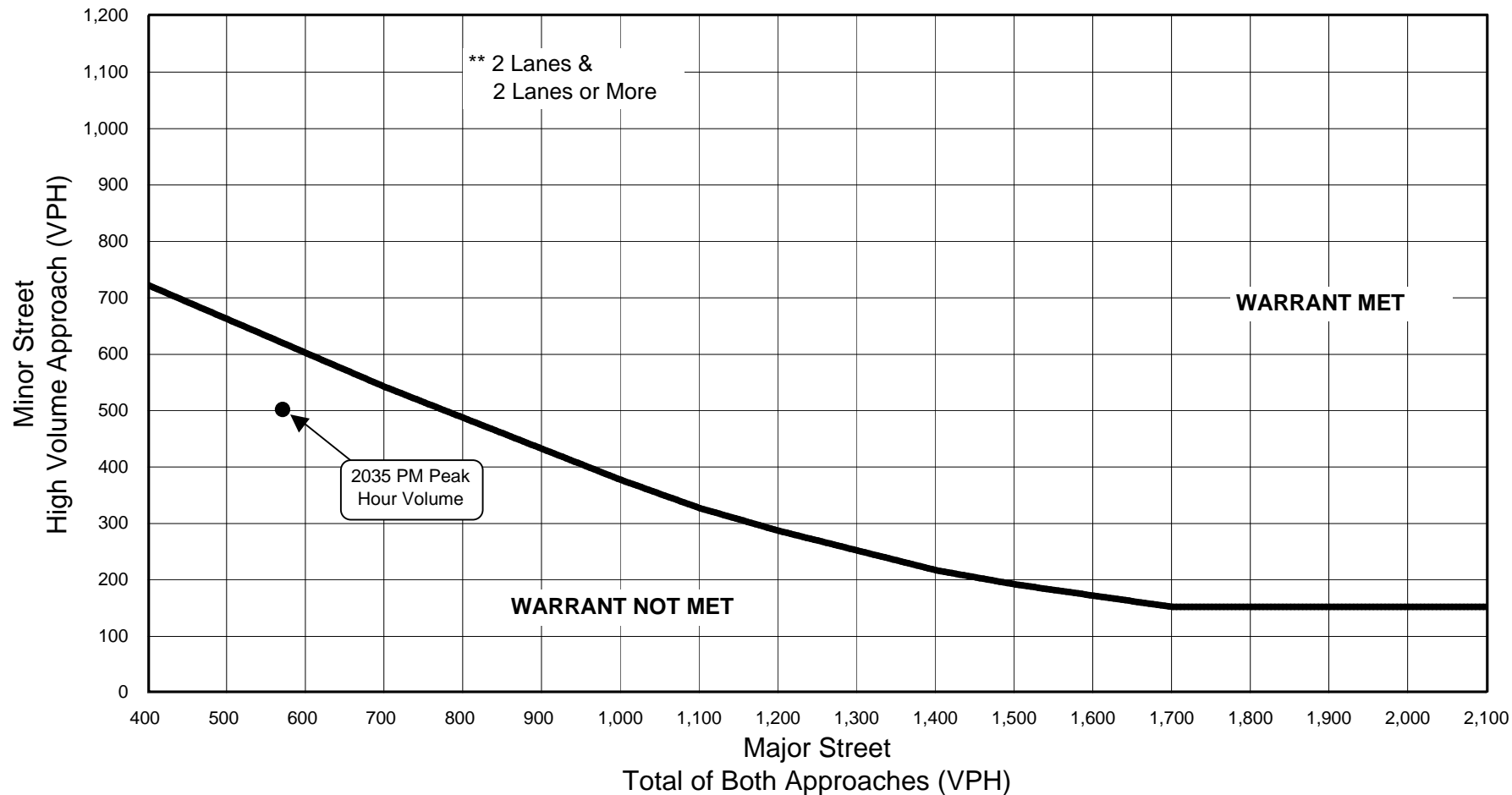
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**50th Avenue NW / 85th Street NW
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



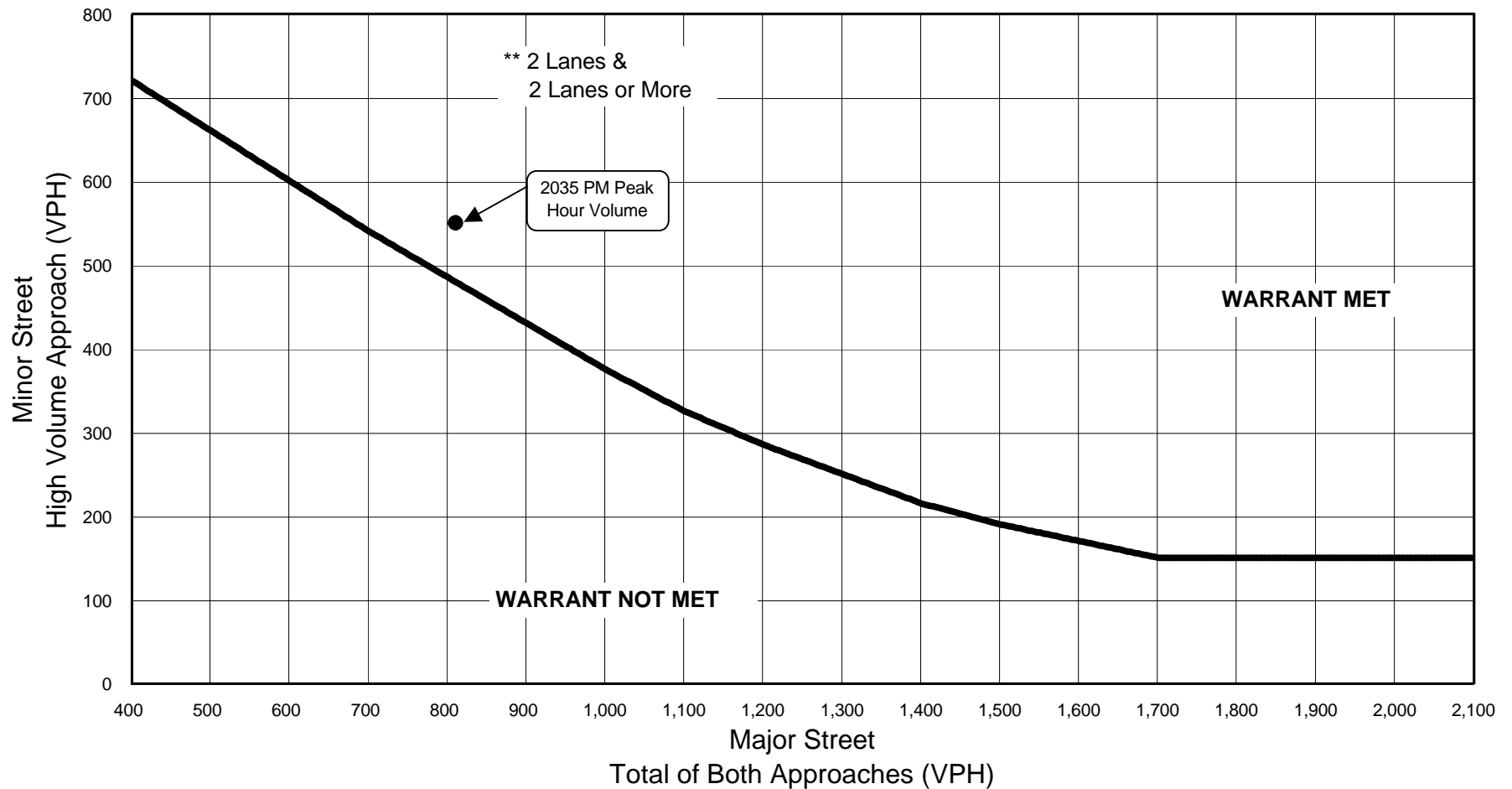
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**60th Avenue NW / 85th Street NW
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



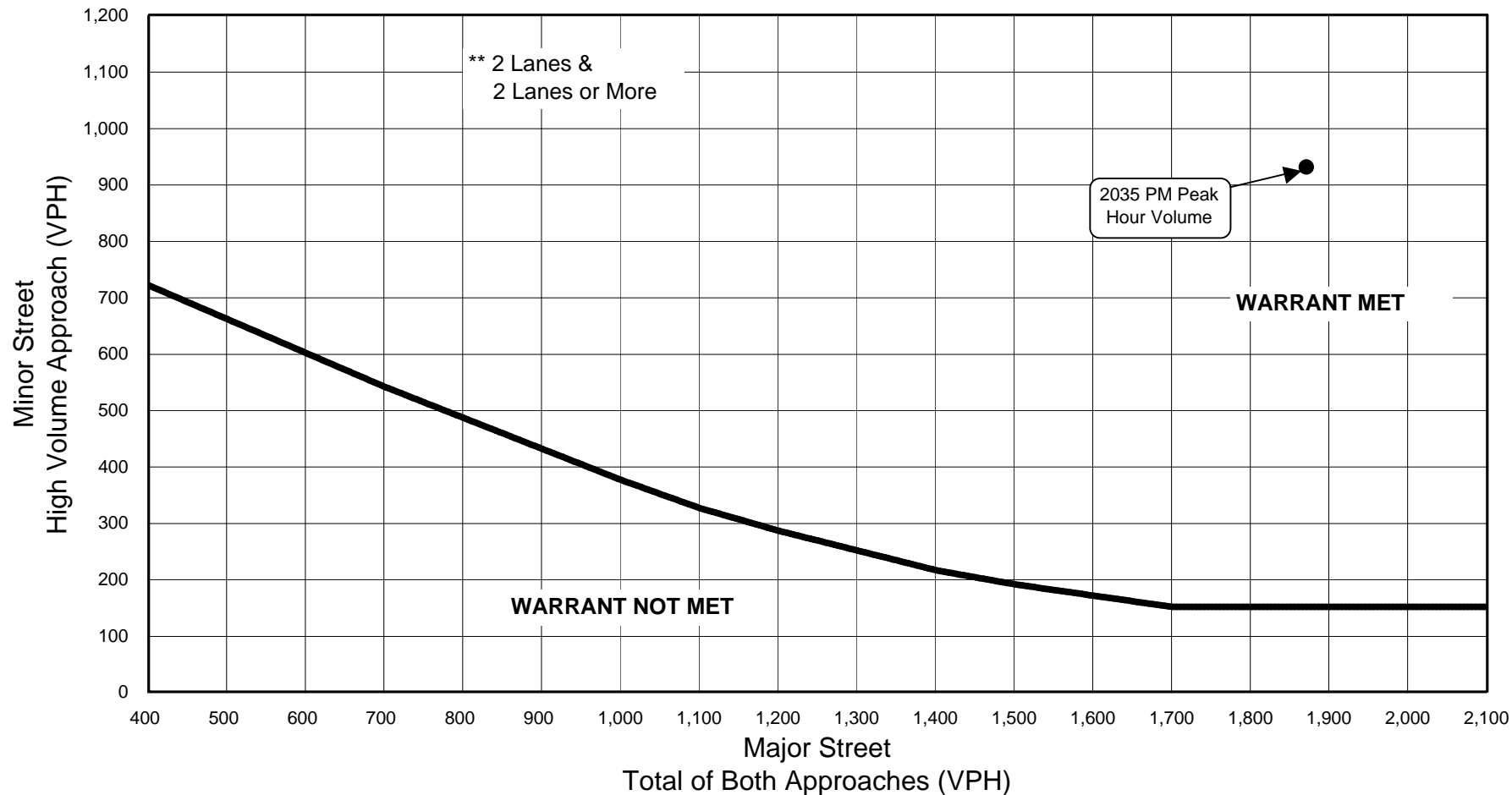
Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**CSAH 3 / 65th Street NW
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**



Warrant Met for 1 Hours

* NOTE: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes.

** The first number refers to the number of lanes of approach on the major street and the second number refers to the number of lanes of approach on the minor street.

**60th Avenue NW / CSAH 4
Signal Warrant Analysis**

**Warrant 11 -
Peak Hour Volume Warrant**